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ABSTRACT

Developed and field-tested over a 2-year period by vocational teachers in West Virginia, this competency-based building construction curriculum contains five units of study: Safety, form carpentry, carpentry, masonry, and plumbing. Each unit is subdivided into several competencies, and for each competency taught the performance objectives, learning activities, and criterion evaluation are specified and the needed forms and reference materials are included. (BM)

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ED142787

BUILDING CONSTRUCTION

COMPETENCY-BASED EDUCATION CURRICULUM

By

West Virginia Building Construction Teachers

U S DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION

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This curriculum was developed in West Virginia during 1974 and 1975 through the cooperation and support of the Bureau of Vocational, Technical and Adult Education, West Virginia Department of Education and the U. S. Office of Education.

OE 011 910

PREFACE

It is with the greatest pleasure that we bring you another West Virginia competency-based education (CBE) curriculum. The Building Construction curriculum was developed and field-tested over a two year period by many vocational teachers from across West Virginia.

The Bureau of Vocational, Technical and Adult Education, State Department of Education, began advocating CBE curriculum in 1974. Since that time we have produced state CBE curricula in a number of additional occupational areas. We also have a number of CBE curricula currently in the process of being developed and/or field tested.

This Building Construction curriculum was disseminated to West Virginia Building Construction teachers at the Annual Vocational Education Conference in August of 1977 at West Virginia University. Additional copies of this curriculum are available at our State Vocational Curriculum Laboratory.

I trust this Building Construction curriculum will help your program. Any suggestions you may have for improving this curriculum may be sent to the curriculum lab. Through this and other feedback we plan to continually update our curriculum.

Clarence Burdette
Assistant State Superintendent of Schools
Bureau of Vocational, Technical and
Adult Education

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Unit 01	Safety
Unit 02	Form Carpentry
Unit 03	Carpentry
Unit 04	Masonry
Unit 05	Plumbing

STUDENT COMPETENCY SHEET

Unit:	01	Safety
Competency Statement:	01	Identifies shop safety rules and regulations
Performance Objective:	01	You will demonstrate your ability to identify shop safety rules and regulations by written examination. You must complete the examination. All answers must be in agreement with the previously prepared answer key.

Learning Activities:

1. Read Modern Carpentry, pages 25-26. Make a list of all safety rules mentioned. Compare your list with the list of another student, and then submit your list to the instructor.

2. View the cassette/filmstrip, "General Shop Safety" or Primitive Pete (General Motors).

3. Attend a lecture/demonstration on shop safety.
   A. Take notes as needed.
   B. Complete the safety quiz following the lecture.
   C. Have the instructor evaluate your answers.

Criterion Evaluation:

You will demonstrate your ability to identify shop safety rules and regulations on a written examination. You must complete the examination. All answers must be in agreement with the previously prepared answer key.

STUDENT COMPETENCY SHEET

Unit:	01	Safety
Competency Statement:	02	Recognizes safety hazards and violations
Performance Objective:	01	Given the National Standard School Shop Safety Inspection Check List form you will demonstrate your ability to recognize shop safety hazards and violations of safety rules or regulations of the school by completing an inspection of a designated area in which hazards or violations have been previously created by the instructor. Your completed inspection form must be in complete agreement with the instructors copy of the same form.

Learning Activities:

1. Obtain and review the form, Natinal Standard School Shop Safety Inspection Checklist.
   A. List the major areas covered in the form.
   B. Make an inspection of your own shop area using the form as a guide.
   C. Make a report of your inspection.

2. Obtain your instructor's approval and make safety inspections of the school.
   A. Use the School Shop Safety Inspection form as a guide.
   B. Exercise care not to interrupt other classes.
   C. Report your results to the instructor.

Criterion Evaluation:

The instructor will provide you with the Standard School Shop Safety Inspection Checklist and create several unsafe conditions in the shop area. (Note: All shop activity will cease until after the shop area has been inspected and returned to normal.) Use the form provided and check off all unsafe conditions in the shop area.

NATIONAL STANDARD SCHOOL SHOP SAFETY INSPECTION CHECK LIST

Prepared by the Joint Safety Committee of the
AMERICAN VOCATIONAL ASSOCIATION — NATIONAL SAFETY COUNCIL

_____ Date_____

_____

INTRODUCTION

A safe environment is an essential part of the school shop safety education program. The safe environment will exist only if hazards are discovered and corrected through *regular* and *frequent* inspections by school personnel—administrators, teachers and students. Safety inspections are to determine if everything is satisfactory.

Inspections may be made at the request of the board of education, the school administration or upon the initiative of the teacher. Some communities have drawn upon the cooperative service of professional safety engineers, inspectors of state labor departments, insurance companies and local safety councils to supplement and confirm inspections by school personnel.

The National Standard School Shop Safety Inspection Check List, recommended by the President's Conference on Industrial Safety is an objective inspection procedure for the school shop.

DIRECTIONS

WHO INSPECTS?

This will depend upon local policies. It is recommended, however, that shop teachers, and students—the student safety engineer and/or student safety committee—participate in making regular inspections. This not only tends to share responsibility but stimulates a broader interest in the maintenance of a safe school shop.

WHEN TO INSPECT?

As a minimum, a safety inspection should be made at the beginning of every school term or semester. More frequent inspections may be advisable.

HOW TO INSPECT?

Inspections should be well planned in advance.

Inspections should be systematic and thorough. No location that may contain a hazard should be overlooked.

Inspection reports should be clear and concise, but with sufficient explanation to make each recommendation for improvement understandable.

FOLLOW-UP

The current report should be compared with previous records to determine progress. The report should be studied in terms of the accident situation so that special attention can be given to those conditions and locations which are accident producers.

Each unsafe condition should be corrected as soon as possible in accordance with accepted local procedures.

A definite policy should be established in regard to taking materials and equipment out of service because of unsafe conditions.

The inspection report can be used to advantage as the subject for staff and class discussion.

CHECKING PROCEDURE

Draw a circle around the appropriate letter, using the following letter scheme:

S — Satisfactory (needs no attention)
A — Acceptable (needs some attention)
U — Unsatisfactory (needs immediate attention)

Recommendations should be made in all cases where a "U" is circled. Space is provided at the end of the form for such comments. Designate the items covered by the recommendations, using the code number applicable (as B-2).
In most categories, space is provided for listing of standards, requirements or regulations which have local application only.

A. GENERAL PHYSICAL CONDITION

1. Machines, benches, and other equipment are arranged so as to conform to good safety practices ..... S A U
2. Condition of stairways ..... S A U
3. Condition of aisles ..... S A U
4. Condition of floors ..... S A U
5. Condition of walls, windows, and ceiling ..... S A U
6. Illumination is safe, sufficient, and well placed ..... S A U
7. Ventilation is adequate and proper for conditions ..... S A U
8. Temperature control ..... S A U
9. Fire extinguishers are of proper type, adequately supplied, properly located and maintained ..... S A U
10. Teacher and pupils know location of and how to use proper type for various fires ..... S A U
11. Number and location of exits is adequate and properly identified ..... S A U
12. Proper procedures have been formulated for emptying the room of pupils and taking adequate precautions in case of emergencies S A U
13. Lockers are inspected regularly for cleanliness and fire hazards. S A U
14. Locker doors are kept closed ..... S A U
15. Walls are clear of objects that might fall ..... S A U
16. Utility lines are properly identified ..... S A U
17. Teachers know the procedure in the event of fire including notification of the fire department and the evacuation of the building. S A U
18. Air in shop is free from excessive dust, smoke, etc. .... S A U
19. _____ S A U
20. _____ S A U
21. _____ S A U
22. _____ S A U
23. Evaluation for the total rating of A. GENERAL PHYSICAL CONDITION ..... S A U

B. HOUSEKEEPING

1. General appearance as to orderliness..... S A U

2. Adequate and proper storage space for tools and materials. S A U

3. Benches are kept orderly..... S A U

4. Corners are clean and clear..... S A U

5. Special tool racks, in orderly condition, and provided at benches and machines..... S A U

6. Tool, supply, and/or material room is orderly..... S A U

7. Sufficient scrap boxes are provided..... S A U

8. Scrap stock is put in scrap boxes promptly..... S A U

9. Materials are stored in an orderly and safe condition.. S A U

10. A spring lid metal container is provided for waste and oily rags. S A U

11. All waste materials and oily rags are promptly placed in the containers..... S A U

12. Containers for oily rags and waste materials are frequently and regularly emptied..... S A U

13. Dangerous materials are stored in metal cabinets..... S A U

14. Machines have been color conditioned..... S A U

15. Safety cans are provided for flammable liquids..... S A U

16. Bulk storage of dangerous materials is provided outside of the main building..... S A U

17. A toe-board or railing around a mezzanine used for storage or washing facilities..... S A U

18. Materials are stored in an orderly and safe condition on this mezzanine..... S A U

19. Flammable liquids are not used for cleaning purposes S A U

20. Floors are free of oil, water and foreign material..... S A U

21. Floors, walls, windows, and ceilings are cleaned periodically. S A U

22. _____ S A U

23. _____ S A U

24. _____ S A U

25. _____ S A U

26. Evaluation for the total rating for B. HOUSEKEEPING S A U

C. EQUIPMENT

1. Machines are arranged so that workers are protected from hazards of other machines, passing students, etc..... S A U

2. Danger zones are properly indicated and guarded..... S A U

3. All gears, moving belts, etc., are protected by permanent enclosure guards..... S A U

4. All guards are used as much as possible..... S A U

C. EQUIPMENT (continued)

5. All equipment control switches are easily available to operator. S A U

6. All machines are "locked off" when instructor is out of the room. S A U

7. Brushes are used for cleaning equipment..... S A U

8. Nonskid areas are provided around machines..... S A U

9. Machines are in safe working condition..... S A U

10. Machines are guarded to comply with American Standards Association and local state code..... S A U

11. Adequate supervision is maintained when students are using machines and dangerous tools..... S A U

12. Tools are kept sharp, clean and in safe working order S A U

13. All hoisting devices are in safe operating condition... S A U

14. Machines are shut off while unattended..... S A U

15. Adequate storage facilities for tools, equipment, etc., not in immediate use ..... S A U

16. _____ S A U

17. _____ S A U

18. _____ S A U

19. _____ S A U

20. Evaluation for the total rating for C. EQUIPMENT.. S A U

D. ELECTRICAL INSTALLATION

1. All switches are enclosed..... S A U

2. There is a master control switch for all of the electrical installations ..... S A U

3. Electrical outlets and circuits are properly identified.. S A U

4. All electrical extension cords are in safe condition and are not carrying excessive loads..... S A U

5. All machine switches are within easy reach of the operators. S A U

6. Electrical motors and equipment are wired to comply with the National Electric Code..... S A U

7. Individual cut-off switches are provided for each machine. S A U

8. Machines are provided with overload and underload controls by magnetic pushbutton controls..... S A U

9. No temporary wiring in evidence..... S A U

10. _____ S A U

11. _____ S A U

12. _____ S A U

13. _____ S A U

14. Evaluation for the total rating for D. ELECTRICAL INSTALLATION .....S A U

E. GAS

1. Gas flow to appliances is regulated, so that when appliance valve is turned on full, the flames are not too high..... S A U

2. Gas appliances are properly insulated with asbestos or other insulating material from tables, benches, adjacent walls, or other flammable materials ..... S A U

3. No gas hose is used where pipe connections could be made. S A U

4. Gas appliances have been adjusted so that they may be lighted without undue hazard..... S A U

5. Students have been instructed when lighting gas appliances to light the match first before turning on the gas..... S A U

6. There are no gas leaks, nor is any odor of gas detectable in any part of the shop..... S A U

7. Shop instruction has been given concerning the lighting of gas furnaces operating with both air and gas under pressure.. S A U

8. When lighting the gas forge, goggles are worn..... S A U

9. When lighting the gas furnace, the following procedure is used: (a) light the match; (b) turn on the gas; (c) drop the match in the hole in top of the furnace..... S A U

10. In shutting down the gas furnace, the gas valve is closed before the air valve..... S A U

11. _____ S A U

12. _____ S A U

13. _____ S A U

14. _____ S A U

15. Evaluation for the total rating for E. GAS..... S A U

F. PERSONAL PROTECTION

1. Goggles or protective shields are provided and required for all work where eye hazards exist..... S A U

2. If individual goggles are not provided, hoods and goggles are properly disinfected before use..... S A U

3. Shields and goggles are provided for electric welding.. S A U

4. Rings and other jewelry are removed by pupils when working in the shop..... S A U

5. Proper kind of wearing apparel is worn and worn properly for the job being done..... S A U

6. Leggings, safety shoes, etc., are worn in special classes such as foundry, etc., when needed..... S A U

7. Respirators are provided for dusty or toxic atmospheric conditions such as when spraying in the finishing room..... S A U

8. Provisions are made for cleaning and sterilizing respirators. S A U

9. Students are examined for safety knowledge ability.. S A U

10. Sleeves are rolled above elbows when operating machines S A U

11. Clothing of students is free from loose sleeves, flopping ties, loose coats, etc. ..... S A U

12. _____ S A U

F. PERSONAL PROTECTION (continued)

13. _____ S A U

14. _____ S A U

15. _____ S A U

16. Evaluation for the total rating for F. PERSONAL PROTECTION. S A U

G. INSTRUCTION

1. Shop Safety is taught as an integral part of each teaching unit. S A U

2. Safety rules are posted particularly at each danger station. S A U

3. Printed safety rules are given each student..... S A U

4. Pupils take a safety pledge..... S A U

5. Use of a safety inspector..... S A U

6. Use of a student shop safety committee..... S A U

7. Use of safety contests..... S A U

8. Motion and/or slide films on safety are used in the instruction. S A U

9. Use of suggestion box..... S A U

10. Use of safety tests..... S A U

11. Use of safety posters..... S A U

12. Talks on safety are given to the classes by industrial men. S A U

13. Tours are taken of industrial plants as a means of studying safety practices ..... S A U

14. Periodic safety inspections of the shop are made by a student committee ..... S A U

15. Men from industry make safety inspections of the shop S A U

16. Student shop safety committee investigates all accidents S A U

17. A proper record is kept of safety instructions which are given, preferably showing the signature of student on tests given in this area ..... S A U

18. Rotate students on the Shop Safety Committee so that as many students as possible have an opportunity to participate... S A U

19. _____ S A U

20. _____ S A U

21. _____ S A U

22. _____ S A U

23. Evaluation for the total rating of G. INSTRUCTION S A U

H. ACCIDENT RECORDS

1. There is a written statement outlining the proper procedure when and if a student is seriously hurt..... S A U

2. Adequate accident statistics are kept..... S A U

3. Accidents are reported to the proper admini trative authority by the instructor ..... S A U

H. ACCIDENT RECORD (continued)

4. A copy of each accident report is filed with the State Department of Education ..... S A U

5. Accident reports are analyzed for instructional purposes and to furnish the basis for elimination of hazards..... S A U

6. _____ S A U

7. _____ S A U

8. _____ S A U

9. _____ S A U

10. Evaluation for the total rating of H. ACCIDENT RECORDS. S A U

I. FIRST AID

1. An adequately stocked first aid cabinet is provided... S A U

2. The first aid is administered by a qualified individual S A U

3. The school has individuals qualified to administer first aid. S A U

4. _____ S A U

5. _____ S A U

6. _____ S A U

7. _____ S A U

8. Evaluation for the total rating of I. FIRST AID.... S A U

RECOMMENDATIONS

Code No.	

For additional copies in packets of 50 send $1.42 to National Safety Council, 425 North Michigan Avenue, Chicago, Ill. 60611

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STUDENT COMPETENCY SHEET

Unit:	01	Safety
Competency Statement:	03	Interprets safety rules and regulations
Performance Objective:	01	You will demonstrate your ability to interpret safety rules and regulations pertaining to industrial and shop working conditions and practices. All answers must be in agreement with the School Shop Safety Policy as judged by the instructor.

Learning Activities:

1. Read the School Safety Manual and/or a safety handout provided by the instructor.
   A. List the five rules which you feel are the most important.
   B. Write a report discussing how you would enforce safety rules in the school shop area and the importance you would place on safety.
   C. Have the instructor evaluate your responses.

2. Take an active part in the shop safety program by:
   A. Attending all scheduled meetings.
   B. Participate as chairperson and speaker on a rotating basis.
   C. Take notes as necessary.
   D. Complete the quiz at the close of each safety meeting.
   E. Have the instructor evaluate your answers.

3. Develop a bulletin board display on safety by completing the following.
   A. Work with other selected students and complete the following:
      1. Develop a safety bulletin board.
      2. Research outside sources for data on safety.
      3. Develop safety slogans and posters.
      4. Explain, in writing, how safety displays could be judged and awards issued.

Criterion Evaluation:

For each safety rule listed, write a brief statement explaining the purpose or main intent of the rule. All responses must be in agreement with the School Safety Policy as judged by the instructor.

All responses must be completed.

1. Practical joking or horseplay during school hours is prohibited.

2. Compressed air or gas shall not be blown at a fellow student, nor be used for dusting clothing on any part of the body.

3. Work areas shall be neat and orderly at all times.

4. Portable metal ladders shall not be used unless authorized.

5. Tools should not be used if the handles are loose, cracked, or splintered.

6. All injuries shall be reported to the instructor.

7. Power tools should not be used in wet or damp areas.

8. Power tools or equipment will not be used without proper authorization.

9. Remove watches, rings, and metal pens before working on electrical circuit.

10. Always use the correct tool for the job.

11. Wear proper clothing and shoes.

STUDENT COMPETENCY SHEET

Unit:	01	Safety
Competency Statement:	04	Displays an acceptable safety attitude
Performance Objective:	01	You will demonstrate your ability to follow shop safety regulations by obtaining a satisfactory rating during periodic safety observations. These observations will be made at least once during each grading period and will be unannounced. You must be observing all shop safety regulations during each of the observation periods for the course of the school year.

Learning Activities:

1. Complete a safety notebook on a continuing basis.
   A. Record all changes in shop rules.
   B. Gather articles on safety from outside sources which pertain to your trade.
   C. Keep a notebook on the information given at each meeting.
   D. Have the instructor periodically inspect your notebook.

2. Construct an outline for conducting a safety meeting.
   A. Use the outline to conduct a safety meeting when selected as chairperson.
   B. Develop a safety quiz and answer key. Have the instructor evaluate your outline and quiz at lease one week before you conduct the safety meeting.

Criterion Evaluation:

You will demonstrate your ability to follow shop safety regulations by obtaining a satisfactory rating during periodic safety observations. These observations will be made at least once during each grading period and will be unannounced. You must be observing all shop safety regulations during each of the observation periods for the course of the school year.

STUDENT COMPETENCY SHEET

Unit:	02	Form Carpentry
Competency Statement:	01	Identifies and states the usage of hand tools for form carpentry.
Performance Objective:	01	Shown a display of hand tools common to form carpentry, you will identify each tool by name and state in writing at least one usage for each hand tool. All identifications must be in agreement with a previously prepared answer key, and all statements on usage must agree with the available reference material.

Learning Activities:

1. Read Modern Carpentry, pages 9-22. Make a list of all hand tools listed on these pages. Check your list with your instructor.

2. Read Residential Carpentry, Unit I, "Hand Tools," pages 5D-12D. List in your notebook the usage of each tool called for on the list in Activity 1. For an additional reference, use Modern Carpentry, pages 9-22. Any other references may be used. The instructor will check your list.

3. Attend a demonstration on the identification and usage of hand tools for form carpentry. Take notes on any item that is still unclear to you.

4. Given a list of three tasks, list the hand tools you would use to complete each task. Your instructor will check your responses.

5. Working with another student, take your list of tools and go to the tool display board and practice identifying, either by selecting, pointing to, or touching, the tools called for on your list. Verify each other's answers.

Criterion Evaluation:

The instructor will display a group of hand tools commonly used in form carpentry. Each tool will have a number. List the number of the tool on a sheet of paper, and after the number write the name of that tool and describe at least one use for the tool. You must identify all tools and list at least one use for each tool. All identifications must agree with a previously prepared answer key and all responses on usage must agree with available reference material. You must complete all responses within _____ minutes without using references.

STUDENT COMPETENCY SHEET

Unit: 02 Form Carpentry

Competency Statement: 02 Identifies and uses measuring and layout tools

Performance Objective: 01 Shown a layout and measuring tools (either actual tools or illustrations), you will identify each tool by its proper name and state the basic usage of each tool. All responses will be given orally and must be in agreement with the available references. The tools to be identified will be limited to those illustrated in Modern Carpentry, page 8, Figure 1-1. Also, you will use a 50' steel tape, folding rule, and a framing square to lay out designated materials. All marks must be within + 1/16" of the given measurement. You must complete all responses within _____ minutes.

Learning Activities:

1. Make a list of measuring and layout tools. Use Modern Carpentry, page 8, Figure 1-1. The instructor will check your list.

2. Using any available references, state in writing the basic usage of each tool listed in Activity 1. The instructor will check your work.

3. Obtain an irregular plywood panel. Using a steel tape and framing square, lay out the largest possible square that could be cut from the panel. If you need assistance, consult the instructor. Inform the instructor when you have the square marked.

5. Obtain a 2" x 8" board which is at least 7' in length. Lay out the board so that two pieces of lumber 2" x 4" x 6' can be cut from it. Inform the instructor when you have the work completed.

Criterion Evaluation:

Shown a layout and measuring tools (either actual tools or illustrations), you will identify orally each tool by its proper name and state the basic usage of each tool. All responses must be in agreement with the available references. With the assistance of another student, lay out a 25' square on the shop floor. Check it diagonally, and square all corners. You must get all points within + 1/16".

STUDENT COMPETENCY SHEET

Unit:	02	Form Carpentry
Competency Statement:	03	Identifies types and grades of lumber
Performance Objective:	01	Given samples of lumber used and sold locally for construction and displayed in the classroom, you will identify each type as to species. Also, given three different grades of lumber, you will identify each sample of lumber according to the grade. You must identify the species by correct name and grade each sample so they will be in agreement with the American Wood Institution Classifications.

Learning Activities:

1. Read Modern Carpentry, pages 53-69. Answer questions 3-4 and 8-11 on page 69. Check your answers with the instructor and record the correct answers in your notebook for future use.

2. Attend a presentation on various grades and species of lumber normally carried in stock in building supply outlets. Take notes. Be sure your notes include the grades and species carried in this area. Obtain a group of softwood samples from the shop area. Write the proper name of each piece and have the instructor check your list.

3. Obtain from your instructor samples of hard and soft wood. Using any reference available, identify each sample as to species. Record this in your notebook. The instructor will evaluate your work.

4. Arrange the following woods according to the hardness of the species:

a. pine	c. oak	e. fir	g. birch
b. cedar	d. poplar	f. maple	h. mahogany

The instructor will check your work.

Criterion Evaluation:

The instructor will select samples of lumber used in local construction. Each piece of lumber will have a number. Write that number on a sheet of paper, and, next to the number, write the name of that type or species of lumber. Also, the instructor will display three grades of lumber from one species of lumber. Each sample will have a letter. Write that letter on a sheet of paper, and, next to the letter, list what grade of lumber the sample is. You must be in agreement with the American Wood Institution classification. All responses must be completed.

STUDENT COMPETENCY SHEET

Unit:	02	Form Carpentry
Competency Statement:	04	Identifies terms related to form carpentry
Performance Objective:	01	Given a list of 30 terms used in form carpentry and a scrambled list of definitions, you will match each term with the correct definition. You will have sufficient time to complete your responses.

Learning Activities:

1. Using Modern Carpentry, pages 87-110 and pages 469-472, and any other references, identify each term listed below and record them in your notebook. Have the instructor check your work.

A. align	P. layout	EE. sheathing
B. beam	Q. mud-sill	FF. square
C. brace	R. plate	GG. stem wall
D. bulkhead	S. plumb	HH. step-form
E. cleat	T. pier	II. scaffold
F. chamfer	U. pilaster	JJ. sole-plate
G. duplex nails	V. panel	KK. leads
H. expansion joint	W. plywood	LL. coffer dam
I. elevation	X. stud	MM. grade beam
J. footer	Y. sill	NN. wales and/or waler
K. foundation	Z. spreader	OO. scab
L. grade point	AA. stake	
M. kicker	BB. steel-reinforcing	
N. key	CC. snap-tie	
O. lacing	DD. strut	

2. Attend a lecture by your instructor on identification of terms used in form carpentry. Take notes on any term that still remains unclear to you.

3. Select any 15 terms and draw a sketch that illustrates that term as found on an actual project. Any references may be used. The instructor will check your sketches.

4. Provided with a list of form carpentry terms, select a fellow student and practice orally, identifying the various terms. Your student partner will verify the answers.

Criterion Evaluation:

Match the following list of 30 forming terms with the list of definitions. You must achieve at least _____ accuracy. All responses must be completed within _____ minutes.

A.	align	_____ 1.	Material used to permit concrete movement
B.	brace	_____ 2.	Used to trim concrete in forms
C.	cleat	_____ 3.	The given height of concrete pour
D.	chamfer	_____ 4.	The height of concrete in form
E.	duplex nails	_____ 5.	Bearing post for girder seat
F.	elevation	_____ 6.	Plan or scope of work
G.	expansion joint	_____ 7.	A horizontal member between two or more points
H.	key	_____ 8.	Creates bond for future concrete pour
I.	footer	_____ 9.	Foundation of a wall
J.	layout	_____ 10.	A type of wood used for sheathing
K.	pier	_____ 11.	Top or bottom of studwall
L.	beam	_____ 12.	Cover of form over studwall
M.	grade point	_____ 13.	Ties wales together
N.	scab	_____ 14.	To align forms together
O.	pilaster	_____ 15.	To assure uniform spread of form
P.	lacing	_____ 16.	To operate pile-hammer in
Q.	wales	_____ 17.	A bar or brace
R.	snap-tie	_____ 18.	A patent alignment spreader
S.	strut	_____ 19.	Bottom plate of a studwall
T.	spreader	_____ 20.	Have 90^{o} angles all sides
U.	leads	_____ 21.	Adds strength under a shelf
V.	plate	_____ 22.	Adds strength in a splice
W.	sheathing	_____ 23.	A line perpendicular to a level surface
X.	stud	_____ 24.	To heel a brace
Y.	plywood	_____ 25.	A double-headed nail
Z.	sole-plate	_____ 26.	To align and support form
AA.	plumb	_____ 27.	To get form in straight line
BB.	stake	_____ 28.	To receive a horizontal structural number
CC.	square	_____ 29.	An upright member in panel

Answer Key for Criterion Evaluation

1. G
2. D
3. F
4. M
5. O
6. J
7. L
8. H
9. I
10. Y
11. V
12. W
13. P
14. Q
15. T
16. U
17. S
18. R
19. Z
20. DD
21. C
22. N
23. AA
24. CC
25. E
26. B
27. A
28. K
29. X

STUDENT COMPETENCY SHEET

Unit: 02 Form Carpentry

Competency Statement: 05 Reads blueprints for foundation layout to determine materials needed for construction

Performance Objective: 01 Given a blueprint of a foundation plan, you will determine the amount of concrete and all carpentry materials needed to complete the concrete form of that portion of the plan designated by your instructor. You may use references and you must meet the following criteria:
1. All work completed
2. All materials estimated within +10% accuracy
3. No materials listed which are not necessary

Learning Activities:

1. Read pages 94-95 in Modern Carpentry, "Wall Forms". Using this and any other references, define the following terms:
   a. sheathing
   b. studs
   c. wales
   d. braces
   e. stakes
   f. spacers
   g. tie rod or snap tie

   Your instructor will check your work.

2. Answer the following questions from the reading assignment in Activity 1.
   a. What type of sheathing can be used in building wall forms?
   b. What spacing is used between studs and wales?

   Your instructor will check your work.

3. Construct a wall form six feet high, eight feet long, eight inches wide. Label all components and show all dimensions. Your instructor will check your work.

4. Determine how many of each of the following materials are needed to construct the wall form in Activity 3.
   a. studs
   b. wales
   c. sheathing
   d. braces
   e. snap ties
   f. stakes

5. Read pages 108 and 109 in Modern Carpentry, "Estimating Materials." Write the formula for determining the number of cubic yards of concrete needed to fill a form. From this formula, determine the quantity of concrete needed to pour the form in Activity 3. Your instructor will check your work.

6. Secure from your instructor the foundation plan used in a recent construction job. List the quantities of materials needed for a designated portion of that plan. Check your estimation with a key provided by your instructor. Repeat this activity using a different foundation plan. Your instructor will check your work.

Criterion Evaluation:

Given a blueprint of a foundation plan, you will determine the amount of concrete and all carpentry materials needed to complete the concrete form of that portion of the plan designated by your instructor. You may use references and you must meet the following criteria:

1. All materials estimated within +10% accuracy.
2. No materials listed which are not necessary.

STUDENT COMPETENCY SHEET

Unit:	02	Form Carpentry
Competency Statement:	06	Identifies types of form fasteners and states usage of each
Performance Objective:	01	Shown a display of forming fasteners which include six types of nails, four types of screws, five types of bolts, one snap-tie, and two types of gauge tie wire, you will identify each fastener and state one use of each type. All responses must agree with the available resources.

Learning Activities:

1. Read General Construction Trades, Unit III, "Wood Fasteners," pages 37-D and 38-D, and Modern Carpentry, pages 95-96. List on paper each fastener mentioned in the reading and state how and where such fasteners are used. Have a classmate check your answers.

2. Obtain a list of fasteners from the instructor and use any available resources to identify each type.

3. Working with another student, go to the General Construction Trades and view TM-1, "Types of Nails," page 41-D; TM-2, "Types of Screws," page 43-D; TM-3 "Types of Bolts," page 45-D; and pages 95-96 of Modern Carpentry or any other reference. Practice identifying either orally or in writing the different types of wood fasteners. Verify each other's answers.

4. Given a list of designated tasks, list the types of form fasteners you would use and state why you made the selection. The instructor will evaluate your work.

Criterion Evaluation:

The instructor will display a variety of fasteners used in form carpentry. Each fastener will be numbered. On a sheet of paper list the number of each fastener and next to the number, write the correct name of the fastener and state one use of that fastener. All responses must agree with available references.

STUDENT COMPETENCY SHEET

Unit:	02	Form Carpentry
Competency Statement:	07	Identifies and states the usage of portable hand power tools and lists the general and specific safety rules governing the use of portable hand power tools.
Performance Objective:	01	Shown a display of different portable hand power tools, you will write the correct name of the tool, describe the use of the tool, and list the specific safety rules to be observed when using the tool. Also, list the general safety rules that are to be observed when using any portable power hand tool. You must complete all required responses, and each response must be in agreement with the available references.

Learning Activities:

1. Read Modern Carpentry, Unit II, "Power Tools," pages 27-41, and Residential Carpentry, pages 60-D through 65-D. List different portable hand tools. Secure an answer key from the instructor and check your responses.

2. View the portable hand power tools on the shop display board. With a fellow student, practice listing each tool. Refer to Residential Carpentry, TN-2, page 69-D, and Modern Carpentry, Figure 2-26, page 36, and check each other's answers.

3. Attend a lecture and demonstration on uses of portable hand power tools. List, in writing, the uses of each tool. The instructor will evaluate your work.

4. Read Residential Carpentry, pages 60-D through 65-D. List the general safety rules for the use of portable hand tools. Also list the specific rules for different portable hand power tools. Your answers must be in agreement with available resources.

Criterion Evaluation:

The instructor will display different portable hand power tools. Each tool will have a number. On a sheet(s) of paper supplied by the instructor, complete the following items.

1. List the number of each tool. After each number, write the name of the tool, describe the use of the tool, and list the specific safety rules to be observed when using the tool.
2. List the general safety rules to be observed when using portable hand power tools.

You must complete all required responses and each response must be in agreement with available references.

STUDENT COMPETENCY SHEET

Unit:	02	Form Carpentry
Competency Statement:	08	Uses portable hand power tools
Performance Objective:	01	Given drawings that require the use of different portable hand power tools, you will cut and shape the projects on the drawings. All materials must be shaped to within 1/16" as described on the drawing. Each power tool must be used as directed on the drawings, and all shop safety rules must be observed. You will have time to complete the activity.

Learning Activities:

1. Read Modern Carpentry, Unit 2, "Power Tools," pages 27-42. Answer questions 1-9 on page 42. Have the instructor check your work.

2. Using any available references, make a list of operations or jobs that can be done by using the portable hand power tools listed below.
   a. saber saw
   b. electric drill
   c. reciprocating saw
   d. electric screwdriver
   e. electric hand saw
   f. power nailer

   Have the instructor check your work.

3. Using Modern Carpentry, pages 27-42, or Residential Carpentry, pages 53-D through 90-D, list in writing the safety rules to be observed when using each portable hand tool listed in Activity 2. Study them and be prepared to list on a test the safety rules to be observed when using each specific power tool.

4. Attend a demonstration by the instructor on the use of portable hand power tools. List step by step the approved procedures for using each. Be prepared to orally discuss and answer questions on the use of power tools.

5. Obtain one of the power tools listed in Learning Activity 2. Also obtain some scrap lumber and a drawing from the instructor. Lay out the wood, and under the direction of the instructor or a student designated by the instructor, use the power tool to complete the task detailed on the drawing. Discuss your performance with the observer. Repeat this activity until you can properly use each power tool. Demonstrate the power use of a power tool designated by the instructor by laying out and completing specified projects. Any cuts must be written 1/16". All safety rules must be observed. This activity will be closely supervised and checked by the instructor.

Criterion Evaluation:

The instructor will furnish several drawings and will require you to demonstrate the proper use of the different power tools listed in the Performance Objective. You must cut and shape all projects per specifications so that the following criteria are met:

1. All materials are shaped with 1/16".
2. All power tools must be used as described on the drawings.
3. All shop safety rules must be observed for each machine used.
4. The activity must be completed within the time designated by the instructor.

STUDENT COMPETENCY SHEET

Unit: 02 Form Carpentry

Competency Statement: 09 Constructs wall forms

Performance Objective: 01 Given a drawing for a wall form and having access to the necessary tools, materials, and equipment, you will construct the wall forms as shown on the drawing. All joints must be within 1/8". The form must be aligned, plumbed, and braced to receive re-steel and be ready for concrete pouring. The instructor will determine the time for completion. Any reference may be used.

Learning Activities:

1. Using any references, look up the definition for align and plumb.

2. Read, view, and study wall forms as shown in Residential Carpentry, page 9-G, and Modern Carpentry, pages 94-95.

3. Attend a demonstration on building a wall panel given by the instructor. List the procedures that are followed in constructing a wall form. Ask questions on any procedure unclear to you. The instructor will have you and another student construct a wall form. Complete the wall form following the steps given below. Have the instructor check your work at each step.
   a. Obtain a drawing and make a list of all tools and materials.
   b. Lay out and mark all materials.
   c. Construct the wall form and complete all bracing. Make a written evaluation of your work.

4. Refer to Residential Carpentry, Job Sheet #3, "Construct Forms For a Stem Wall," pages 27-G through 29-G, and follow all directions. Note: There will be a progress check after completion of Part B, pages 27-G (materials). Omit parts 1-3 of Part B, Section II (Procedure) because of the use of pre-fab panels. A progress check will be conducted at the conclusion of the activity by the instructor.

Criterion Evaluation:

The instructor will issue a section of a drawing of a wall form. You will be given access to tools, materials, and any other items necessary to construct the wall form shown in the drawing. The wall form must be aligned, plumbed, braced and ready for concrete pour. All joints must be within 1/8". You will have time to complete the activity, and you may use references.

STUDENT COMPETENCY SHEET

Unit:	02	Form Carpentry
Competency Statement:	10	Shapes and joins material for construction
Performance Objective:	01	Given a drawing of a form wall with specification for blockouts, you will make and install at least two blockouts of varying shapes designated by the instructor. You must make and install at least two blockouts of varying shapes. All tools, materials and equipment will be furnished at your request. The instructor will designate the amount of time for the work. You will work with another student and both will receive credit when the following criteria are met. 1. All work is completed in accordance with specifications and plans. 2. All work is square, plumb, and level. 3. All work is securely fastened and joined without any space exceeding 1/16". 4. All power tools used in accordance with shop safety rules. 5. All work is completed within the designated time.

Learning Activities:

1. Read Carpentry, pages 2 and 3.

2. Attend a lecture/demonstration on the cutting of joints common to form carpentry. Ask questions on any procedures not clear to you. Be prepared to demonstrate how to cut and join a particular joint when so directed by the instructor.

3. Obtain the necessary materials and make those joints designated by the instructor. Have the instructor evaluate your work.

4. Use plans given for a wall form that requires several blockouts and complete the tasks listed below.
   a. Study the plans and detail how you would make and install these blockouts.
   b. Discuss your sketches with the instructor.
   c. After the instructor approves your sketches, obtain the necessary materials and complete all necessary work.

d. Evaluate your work on the basis of the criteria listed in the Performance Objective. Discuss your evaluation with your instructor.
e. After the instructor approves your work, obtain another set of plans for a wall form requiring blockouts and repeat tasks a-d.

5. Complete the Criterion Evaluation. If you successfully complete the evaluation, proceed to the next Performance Objective. If not, have the instructor suggest what Learning Activities you should repeat.

Criterion Evaluation:

Given a drawing of a form wall with specification for blockouts, you will make and install those blocks designated by the instructor. You must make and install at least two blockouts of varying shapes. All tools, materials and equipment will be furnished at your request. The instructor will designate the amount of time for the work. You will work with another student and both will receive credit when the following criteria are met.

1. All work is completed in accordance with specifications and plans.
2. All work is square, plumb, and level.
3. All work is securely fastened and joined without any space exceeding 1/16".
4. All power tools used in accordance with shop safety rules.
5. All work is completed within the designated time.

STUDENT COMPETENCY SHEET

Unit:	02	Form Carpentry
Competency Statement:	11	Identifies the common types of ladders, lists the safety rules governing the use of ladders, and demonstrates the safe use of designated ladders.
Performance Objective:	01	Shown pictures of ladders or actual ladders, you will identify each ladder by the correct name. Also, given two ladders, you will demonstrate the correct safe use of each. Also, in writing, list 16 safety rules for the safe use of ladders. The safety rules listed by you must be in agreement with Modern Carpentry, pages 449-450.

Learning Activities:

1. Read Modern Carpentry, pages 448-449. Answer the following questions. The instructor will check your answers.
   a. List four types of ladders.
   b. What sizes do stepladders come in?
   c. What sizes do regular single ladders come in?
   d. Why should ladders be given a clear finish?
   e. Describe basic care and the proper handling of ladders.
   f. What are the sizes of ladders?
   g. Explain how to erect a ladder.
   h. Why should you inspect your ladder and how often?
   i. Explain the proper way to carry a ladder.
   j. Explain how you should store a ladder.
   k. When a ladder is used to climb onto a roof, it should extend at least how many feet above the roof edge?

2. Using various tools and equipment catalogs, identify the height of each ladder and indicate the minimum and maximum safe working height of each ladder.

3. Study Modern Carpentry, pages 449-450. Write at least one sentence that explains why each rule listed on these pages is important. Compare your answers to those of another student and then have the instructor check your answers.

4. Attend a demonstration on the safe use and care of stepladders and extension ladders. Take notes and ask questions on any information not clear to you. Be prepared to demonstrate the safe use and care of the stepladder and extension ladder when so directed by the instructor.

Criterion Evaluation:

The instructor will display pictures of ladders or actual ladders. Each ladder will have a number. List the number of each ladder with the correct name for each. Also, you will be given two different ladders. You must demonstrate the correct and safe use of each. Finally, you will list 16 safety rules for ladders. You must achieve accuracy for all sections of the evaluation without the use of references. You will have time to complete this exercise. The safety rules listed by you must be in accordance with Modern Carpentry, pages 449-450.

STUDENT COMPETENCY SHEET

Unit:	02	Form Carpentry
Competency Statement:	12	Identifies the common types of scaffolds and lists the safety rules governing the use of each.
Performance Objective:	01	Shown illustrations of various types of scaffolds, you will write the correct name of each scaffold. Also, in writing, list 12 safety rules for the safe use of scaffolds. You must achieve accuracy with the use of any references. Your response must agree with the avialable references. You will have _____ to complete the exercise.

Learning Activities:

1. Read Carpentry, pages 235-253, and Modern Carpentry, pages 445-448. Answer, in writing, the following questions. The instructor will check your responses.
   a. Name two types of scaffolds.
   b. What are suspended scaffolds?
   c. List the different fixed scaffolds and describe each.
   d. Define horse scaffolds.
   e. Where can you use rolling scaffolds?
   f. Describe the essentials of good scaffolding.
   g. Answer questions 1-4 in Modern Carpentry, page 450.

2. Secure pictures from the instructor showing the different types of scaffolds. Practice identifying each scaffold pictured with another student. Verify each other's answers.

3. Review Modern Carpentry, pages 445-448, and Carpentry, pages 235-253. List in your notebook the safety rules that govern the use of the different types of scaffolds. Write a sentence on the importance or purpose of each of the safety rules. Have your instructor check your list.

Criterion Evaluation:

The instructor will display illustrations of scaffolds, each being numbered. You will list each number and write the correct name for each scaffold. Also, you will list 12 safety rules for the safe use of scaffolds. You must achieve accuracy and your responses must agree with Modern Carpentry, pages 445-448, and/or other available references. You will have time to complete the exercise.

STUDENT COMPETENCY SHEET

Unit: 02 Form Carpentry

Competency Statement: 13 Constructs a patent and temporary scaffold

Performance Objective: 01 Furnished with the necessary tools and materials, you will construct a patent scaffold similar to to the one illustrated in Figure 22-5, Modern Carpentry, page 447. The instructor will designate the size and height for your model. Your model will be checked to see if all boards are secured. All work must be completed. All safety rules must be observed as stated on page 448, Modern Carpentry, You will also construct a temporary scaffold as shown in Modern Carpentry, Figure 22-2, page 446. Your instructor will designate the size and the height for the model. Your model must meet the following standards:

1. All scaffold boards nailed securely with 16 D common nails.
2. Scaffold is level.
3. Scaffold is plumbed.
4. Toe boards used on the sides and back.

You will have time to complete the exercise. All safety rules must be observed as stated on page 448, Modern Carpentry. Another student may assist in both parts of this objective.

Learning Activities:

1. Review Modern Carpentry, page 447, Figure 22-5, and pages 445-446.

2. Observe the construction of a temporary scaffold by your instructor.

Criterion Evaluation:

1. Given all tools, materials, and equipment, you will construct a patent scaffold that is two lifts high with the back guard rail, toe board, and outrigger on the front. The scaffold must be plumbed and leveled and all boards secured. You will have time to complete the exercise.

2. Construct a temporary scaffold using the tools, materials, equipment and specifications provided for you by the instructor. Your work will be checked to see if it meets the following criteria:
   a. The height, width, and length of the scaffold agree with specifications.
   b. All boards fastened securely with 16 D common nails.
   c. Scaffold is level and plumb.
   d. Toe boards are used on front and back.
   e. All safety rules in Modern Carpentry, page 448, observed.
   f. Scaffold completed within one hour.
   g. No references used.

   Another student may assist you in both tasks.

STUDENT COMPETENCY SHEET

Unit: 02 Form Carpentry

Competency Statement: 14 Constructs a bulkhead

Performance Objective: 01 Given a drawing of a foundation plan, you will construct the bulkhead designated by the instructor. All required materials, equipment and tools will be provided at your request. Another student may assist in the handling and lifting procedures. All work must meet the following criteria:

1. Concrete retained at places designated on the drawing or as designated by the instructor.
2. Form braced so that it does not move.
3. Chamfer set after bracing and at grade point.
4. Joints permit no leakage of concrete or have no space exceeding 1/8".
5. Form is aligned, plumb, and level.
6. All work completed in the time allotted by the instructor.

Learning Activities:

1. Review Residential Carpentry, page 33-G, Figure 5.

2. Attend a lecture/demonstration on the use and construction of bulkhead in concrete form work. List the places where bulkheads are used and list the procedures for constructing a bulkhead. Have the instructor check your list.

3. Using the drawing given and the list of procedures from Learning Activity 2, obtain the necessary supplies and construct a bulkhead. If you have any difficulty which you cannot solve by using additional references, consult the instructor. The instructor will periodically check your work and the final product.

4. If you had difficulty completing Learning Activity 3, attend a demonstration given by your instructor on constructing a bulkhead. Ask questions on any procedures unclear to you.

5. Obtain a foundation plan and have your instructor designate a bulkhead which is to be constructed. Have the instructor check your work. Obtain the necessary materials and construct the bulkhead. Evaluate your work using the criteria listed in the Performance Objective. Correct any errors. Have the instructor evaluate your work.

Criterion Evaluation:

Given a drawing of a foundation plan, you will construct the bulkhead designated by the instructor. All required materials, equipment and tools will be provided at your request. Another student may assist. All work must meet the following criteria:

1. Concrete retained at places designated on the drawing or as designated by the instructor.
2. Form braced so that it does not move.
3. Chamfer set after bracing and at grade point.
4. Joints permit no leakage of concrete or have no space exceeding 1/8".
5. Form is aligned, plumb, and level.
6. All work completed in the time allotted by the instructor.

5. Obtain a drawing of a complete foundation plan. Gather the necessary materials, construct all forms, and mix and pour the concrete to produce a pier-and-beam unit.

Criterion Evaluation:

The instructor will provide a complete foundation plan for a pier-and-beam unit. You are to construct all forms, set and tie all re-steel, and mix and pour all concrete required to produce the pier-and-beam unit. The unit will be constructed in four sections which are to be in the following sequence: square base, haunch, stem, and beam. You will have access to all equipment, materials, and tools necessary to complete the unit. The time for each section will be given by the instructor. All sections of the unit must be within 1/16" of the specifications, all steel must be set per specifications, all concrete must be mixed according to manufacturer's directions, and the unit must be plumb. Each section must be completed within the allotted time.

STUDENT COMPETENCY SHEET

Unit:	03	Carpentry
Competency Statement:	01	Uses tape and/or transit level to lay out building lines and batter boards
Performance Objective:	01	Given the foundation blueprint layout for establishing perimeter lines and batter boards, lay out building lines by using the 6-8-10 method and checking for accuracy by measuring diagonally. The instructor will determine the amount of time to complete this operation.

Learning Activities:

1. Read Unit #6, Modern Carpentry, pages 87-93. Answer in writing questions 1 through 7, page 109.

2. Attend a demonstration by the instructor who will demonstrate step-by-step procedures of using the 6-8-10 method and checking for accuracy by diagonal method. The demonstration will include the set up and use of the Transit. Record the step-by-step procedures, and perform the same operation and the instructor will observe and evaluate the demonstration.

3. Attend a demonstration by the instructor, who will demonstrate the step-by-step procedures of setting batter boards by using the transit level. Record the procedure and perform the same operation. The instructor will observe and evaluate the operation.

Criterion Evaluation:

The instructor will furnish you with a layout drawing and the grade points to be established. Using a transit level and/or the 6-8-10 method, set up batter boards and establish building lines. All grade stakes should be within 1/16" of level.

STUDENT COMPETENCY SHEET

Unit:	03	Carpentry
Competency Statement:	02	Uses transit level to bench mark and grade points.
Performance Objective:	01	Given the grade points and layout drawing for a foundation you will set bench mark and grade stakes for the removal of soil along the foundation footer line by using a transit level and leveling rod. All grade stakes must be within 1/8 of an inch level. Another student will assist as the rodman, however, the student may not offer any assistance with the transit set up and operation.

Learning Activities:

1. Read Unit 3, Modern Carpentry, pages 43-51. Answer, in writing, questions 1-8, "Test Your Knowledge" on page 51. The instructor will check your responses.

2. Study Residential Carpentry, Unit II, "Site Preparation," pages 19-F, 21-F, 23-F, and 25-F. After doing this, secure illustrations of a transit and rod or actual items which has each part numbered. On a sheet of paper write the number of the part down and list its correct name. Also, on the same paper write the uses of the transit. Have the instructor check your responses.

3. Attend a demonstration by the instructor, who will set up and use a transit with a leveling rod. Record the step-by-step procedures as the activity is demonstrated. Have the instructor check your list of procedures. After your list has been approved, you and another student are to perform the same demonstration using the procedures you listed. The instructor will observe and evaluate your demonstration. The instructor will demonstrate the use of the bench mark as a reference point.

4. Assume the role of a transit operator and have another student be your rodman. You will be given several designated spots by the instructor. You are to determine the elevation at each spot. Then reverse your roles and duplicate the operation just completed. All elevations will be recorded for comparisons and all elevations recorded will be within 1/8 an inch. Your instructor will check your work.

Criterion Evaluation:

The instructor will furnish you with a layout drawing and the grade points to be established. Using a transit level and leveling rod set grade stakes for the removal of soil along the foundation footer line. All stakes must be within 1/8 of an inch of level. You may have a student help as the rodman.

STUDENT COMPETENCY SHEET

Unit:	03	Carpentry
Competency Statement:	03	Identifies types of basic framing construction and the basic parts of a house
Performance Objective:	01	Being shown illustrations of the major types of framing and the basic parts of a house, you will identify each type of framing by the correct name and each part of the house. The parts of the house to be identified will be limited to those shown in Modern Carpentry, page 7. You must make all required identifications, and all responses must agree with a previously prepared key.

Learning Activities:

1. Using any available references, define the following terms in writing. Have the instructor check your responses.
   a. platform or western framing
   b. balloon framing
   c. braced framing
   d. post and beam framing
   e. cathedral or A-frame

2. Using any available references, study illustrations of the five types of framing construction listed in Activity 1.

3. Using Modern Carpentry, page 7, list on a sheet of paper the basic parts of a house. Using any available references, define in writing the 26 basic parts of a house. Have the instructor check your responses.

4. Secure illustrations from your instructor showing the five types of framing and the basic parts of a house. Each type of framing and the basic parts will be numbered. On a sheet of paper, write the number down and next to the number list the correct name of each. Along with a fellow student check your responses.

Criterion Evaluation:

Given numbered drawings of the five types of framing construction, you will write the number of the drawing down and next to the number write the correct name. You will also be given a picture of a house without parts being labeled. You are to darw a line to each part and write the correct name for each. Your answer must be in agreement with the ones listed in Modern Carpentry, page 7.

STUDENT COMPETENCY SHEET

Unit:	03	Carpentry
Competency Statement:	04	Installs floor framing
Performance Objective:	01	Given a foundation and floor plan including all needed specifications you will lay out, mark, cut and install all or that portion of the floor framing designated by the instructor. All materials will be supplied at your request. (The instructor will designate the amount of time for the work). You will work with another student and both of you will receive credit for this Performance Objective provided the following criteria is met: 1. All work must be completed in accordance with the specifications and floor plan. 2. All lumber must be cut and joined to within 1/8" and securely nailed. 3. All work must be square, plumb, and level. 4. All the work must be completed within the designated time.

Learning Activities:

1. Read Modern Carpentry, Unit 7, "Floor Framing", pages 111-113. Answer questions 1-12 on page 134. Have your instructor check your responses.

2. Using available references define the following terms:
   a. box sill
   b. sill plate
   c. girder
   d. header
   e. anchor bolt
   f. joists (floor)
   g. bearing posts
   h. ribbon board
   i. sub flooring
   j. bridging- cross-solid
   k. ledger strip
   l. fire cut joists
   m. double headers
   n. blocking
   o. termite shield

   Record the terms and definitions in your notebook. Along with a fellow student practice orally defining each term until you can identify all terms. If you are in disagreement with any term consult your instructor.

3. Attend a lecture/demonstration by your instructor on floor joists, headers, bridging and bearing partition. List step-by-step what your instructor did in the demonstration. Be prepared to orally discuss the various steps. The instructor will check your list.

4. Obtain a foundation and floor plan. The instructor will designate which section of the plan you are to complete. Along with another student complete the following steps. Have the instructor check your work at each step. Do not proceed to the next step until your work is approved.
   A. Make a list of materials, tools, and equipment needed to frame the designated section of the floor framing drawing.
   B. Lay out and cut the designated section. All cuts must be square and within 1/8" of the length called for in the specifications.
   C. Install all materials in the following sequence:
      1. Fit a termite shield over anchor bolts.
      2. Drill sill plates, fit and bolt them down.
      3. Layout the header and floor joists with a framing square.
      4. Add bridging and begin sub-flooring.

Criterion Evaluation:

The instructor will furnish you with a foundation and floor plan. You will secure all materials and tools to construct the floor framing as shown on the plans. The instructor will designate the time for completing this activity. You will work with another student and both will receive equal credit for the Performance Objective provided the following criteria are met:
1. All work completed in accordance with the specifications and floor plan.
2. All lumber must be joined and cut to within 1/8" and securely nailed.
3. All work must be square, plumb, and level.
4. All work completed within designated time.

STUDENT COMPETENCY SHEET

Unit: 03 Carpentry

Competency Statement: 05 Constructs and erects walls and partitions

Performance Objective: 01 Given floor plans and specifications you will lay out, mark, cut, and install all or that portion of the walls and partitions designated by the instructor. All materials, tools and equipment will be supplied at your request. The instructor will designate the amount of time for the work. You will work with another student and both of you will receive credit for this performance objective provided you meet the criteria given below:

1. All work is completed in accordance with the specifications and floor plans.
2. All lumber is cut and joined within 1/8" and securely nailed.
3. All work is square, plumb and level.
4. All work completed within designated time.

Learning Activities:

1. Read Modern Carpentry, Unit 8, "Wall and Ceiling Framing," pages 135-155. Answer questions 1-12 on page 155. Check your answers with the instructor.

2. Using available references define the following terms:
   a. corner post
   b. sole plate
   c. top plates
   d. studs
   e. diagonal braces and/or plywood corners
   f. blocking
   g. partition tee
   h. headers
   i. doublers
   j. bracing
   k. cripples

   Record the terms and their definitions in your notebook. Along with a fellow student, practice orally defining each term until you can identify all terms. If you are in disagreement with any term, consult your instructor.

3. Attend a lecture/demonstration on the construction of walls and erection of walls. List step-by-step what your instructor did in the demonstration. Be prepared to orally discuss the steps. The instructor will check your list.

4. Obtain a foundation and floor plan. The instructor will designate which section of the plan you will complete. With the aid of another student complete the steps listed below. All steps must be approved by the instructor before continuing the next one.
   A. Make a list of materials needed to perform the designated plan.
   B. Lay out and mark the materials.
   C. Cut the materials.
   D. Construct the walls and erect the partitions. Check your work against the criteria given in the Performance Objective.

5. Construct rough openings for exterior doors and windows.
   A. Construct and install headers and trimmer studs or jacks.

6. Construct rough openings for interior doors.
   A. non bearing walls
   B. load bearing walls.

Criterion Evaluation:

The instructor will furnish you with a foundation and floor plans for constructing the walls and partitions in the plan. You will secure all materials and tools to lay out, cut and construct the designated portion of the drawing. The instructor will designate the time to complete the activity. You will work with another student and both will receive credit for the performance objective providing the following criteria is met:

1. All work completed in accordance with the specifications and floor plans.
2. All lumber must be cut and joined to within 1/8" and securely nailed.
3. All work must be square and level.
4. All work completed within the designated time.

STUDENT COMPETENCY SHEET

Unit: 03 Carpentry

Competency Statement: 06 Installs ceiling joists

Performance Objective: 01 Given ceiling joists plans and specifications, you will lay out, mark, cut, and install all or that portion of ceiling joists designated by the instructor. All materials, tools, and equipment will be supplied at your request. The instructor will designate the amount of time for the work. You will work with another student and both of you will receive credit for the Performance Objective provided the following criteria are met:

1. All work is completed in accordance with the specifications and floor plan.
2. All material is cut and joined within 1/8" and securely nailed.
3. All work is square, plumb, and level.
4. All work completed within the designated time.
5. All power tools used in accordance with shop safety rules.

Learning Activities:

1. Read Modern Carpentry, pages 135-155. Answer questions 1-12 on page 155. Have the instructor check your answers.

2. Using available references define the following terms and record them in your notebook.
   a. ceiling frame
   b. ceiling joists
   c. O.C.
   d. access

   With a fellow student, practice defining each term until you can define all terms.

3. Using available references explain in writing how the following terms can have a dual meaning depending on where they are used in a building:
   a. joists
   b. plates
   c. purlin
   d. rafters

   Check your answers with the instructor.

4. Attend a lecture/demonstration given by your instructor on installing ceiling joists. List step-by-step what your instructor did in the demonstration. Be prepared to orally discuss and demonstrate the various steps. The instructor will check your list.

5. Obtain a ceiling joist plan. Working with another student, complete the following steps. Have the instructor check your work at the completion of each step.
   A. Develop a list of materials needed to install the ceiling joists. Complete your list with an instructor prepared list.
   B. Obtain and lay out the materials listed in Part A.
   C. Cut and install the ceiling joists as per specifications and check your work against the criteria given in the Performance Objective.

Criterion Evaluation:

The instructor will furnish you with ceiling joist plans and specifications. All materials, tools and equipment will be supplied at your request. Lay out, mark, cut, and install all ceiling joists designated by the instructor. The instructor will designate the time to complete the activity. You will work with another student and both will receive equal credit for the Performance Objective providing the following criteria are met:

1. All work is completed in accordance with the specifications and floor plan.
2. All work is cut and joined within 1/8" and securely nailed.
3. All work is square, plumb, and level.
4. All work is completed within the designated time.
5. All power tools used in accordance with shop safety rules.

STUDENT COMPETENCY SHEET

Unit: 03 Carpentry

Competency Statement: 07 Constructs and installs stairs

Performance Objective: 01 Given a plan and specifications for a staircase, you will estimate the material, lay out, cut and construct the staircase. You will receive credit for the performance objective provided the following criteria are met:

1. All work is completed in accordance with the specifications and plans.
2. All materials are cut and joined within 1/16" and securely nailed.
3. All work is square, plumb, and level.
4. All work completed within the time designated by the instructor.
5. All power tools used in accordance with the shop safety rules.
6. Estimates made so that waste material does not exceed 5% of total board feet.

Learning Activities:

1. Read Modern Carpentry, Unit 16, "Stair Construction," on pages 347-360. Answer questions 1-10 on page 360. Have the instructor check your answers.

2. Using any available references, define the following terms and record them in your notebook.

a. headroom	h. stairs	o. semi-housed stair
b. handrail	i. rough	p. staircase
c. housed stair	j. rise	q. stairwell
d. landing	k. run	r. newell post
e. line of flight	l. wall stringer	s. balusters
f. L shaped (types)	m. tread	t. open stair
g. winder (types)	n. riser	u. nosing
		v. skirt board

Be prepared to complete a matching test on terms related to constructing stairs. Have the instructor check your responses.

3. Using available references answer the following questions:
   1. List and explain the two different types of stairs.
   2. Give the first steps used in constructing any stairs.
   3. How do you determine the number of treads and risers needed for any stairs?
   4. How do you determine the rise and run for any stairs?
   5. In designing stairs, list the rules that should be remembered as listed in Carpentry.
   6. Identify four basic types of stairs as to shape and explain how they are fitted into the building.
   7. Draw a typical staircase and label all parts. Have the instructor check your response.

4. Attend a lecture/demonstration given by your instructor on constructing and installing stairs. List step-by-step the procedures used. After having your list checked by the instructor complete the following: (The instructor will check your work after each step.)
   A. Obtain a drawing for constructing a set of stairs and estimate the materials needed to construct the stairs.
   B. Obtain the necessary materials listed in part A and lay out, measure, and mark the materials.
   C. Cut and construct the materials from part B.

   All work must be in accordance with the criteria listed in the performance objective.

5. If additional practice is needed, read Residential Carpentry, Unit I, "Stair Construction," pages 1-15 - 38K. Complete the job sheet and all tests. Have another student check your work.

Criterion Evaluation:

The instructor will furnish you with a plan and specifications for constructing and installing a staircase. You will estimate the material, and lay out, cut and construct the staircase. The instructor will designate the time for completing the activity. Your work must meet the following criteria:
1. All work completed in accordance with the specifications and plans.
2. All materials must be cut and joined within 1/16" and securely nailed.
3. All work must be square, plumb, and level.
4. All work must be completed within the designated time.
5. All power tools used in accordance with shop safety rules.
6. Estimate made so that waste material does not exceed 5% of total board feet.

STUDENT COMPETENCY SHEET

Unit: 03 Carpentry

Competency Statement: 08 Constructs and installs roof framing

Performance Objective: 01 Given a roof framing plan and specifications you will lay out, mark, cut, and install all or that portion of the roof framing designated by the instructor. All materials, tools, and equipment will be supplied at your request. The instructor will designate the time for the work. You will work with another student and both will receive credit for this performance objective when the following criteria are met:

1. All work is completed in accordance with the specifications and plans.
2. All lumber is cut and joined within 1/8" and securely nailed.
3. All work is square, plumb, and level.
4. All work is completed within the designated time.
5. All power tools used in accordance with shop safety rules.

Learning Activities:

1. Read Modern Carpentry, Unit 9, pages 157-184. Answer questions 1-20 on page 184. Have the instructor check your answers.

2. Study the appropriate sections in Modern Carpentry, Residential Carpentry, and list and define the different types of roofs. Have the instructor check your work.

3. Using available references, define the following terms. Record them in your notebook. Be prepared to complete a matching test on roof framing terms. Have the instructor check your work.
   a. plumb cut
   b. purlin cut
   c. purlin
   d. rise
   e. run
   f. pitch
   g. ridge board
   h. barge rafter or verge
   i. birdsmouth
   j. span
   k. valley rafter
   l. collor beam
   m. common rafter
   n. plate
   o. framing square
   p. eave or tail
   q. dormer
   r. gusset
   s. hip rafter
   t. jack rafter or cripple jack
   u. measuring list
   v. heel cut

4. Attend a lecture/demonstration given by the instructor on the use of a framing square. Given designated measurements you will demonstrate to the instructor the correct use of a framing square with regards to roof framing. You will lay out the following rafters - common, hip, valley, and jack.

5. As a review of your knowledge of roof framing, answer questions 22-51 in Carpentry, pages 287-288. Compare your answers with those of another student. Discuss any questions or differences with the instructor.

6. Attend a demonstration on roof framing. Take notes and ask questions on information not clear to you. Working with another student, complete the following steps. Have the instructor check your work at each step before continuing.
   a. Obtain a roof framing plan and specifications.
   b. Study the plans and make a list of all needed supplies and materials.
   c. Lay out and mark all materials.
   d. Cut and install all materials as per specifications and check work to determine if it meets the criteria given in the Performance Objective.

Criterion Evaluation:

The instructor will furnish you with a roof framing plan and specifications. You will lay out, mark, cut, and install all or that portion of the roof framing designated by the instructor. All tools, materials, and equipment needed will be furnished at your request. You will work with another student and both will receive credit for the Performance Objective providing the following criteria are met:

1. All work completed in accordance with specifications and plans.
2. All lumber is cut and joined within 1/8" and nailed securely.
3. All work is square, plumb, and level.
4. All power tools are used in accordance with shop safety rules.

STUDENT COMPETENCY SHEET

Unit:	03	Carpentry
Competency Statement:	09	Lays roof and installs vents, valley flashing
Performance Objective:	01	Given the specifications for roofing a building, you will lay out, mark, cut, and install all or that portion of the roof designated by the instructor. All materials, tools and equipment will be supplied at your request. The instructor will designate the amount of time for the work. You will work with another student and both of you will receive credit for the performance when the following criteria are met: 1. All work is completed in accordance with specifications and plans. 2. All materials are cut within 1/8" and nailed securely. 3. All work is aligned. 4. All work is completed within the designated time. 5. All power tools used in accordance with shop safety rules.

Learning Activities:

1. Read Modern Carpentry, Unit 10, "Roofing Materials," on pages 185-213. Answer the quiz on page 213, questions 1-19. Also, do outside assignment #3, page 213. Your instructor will grade this project.

2. Using available references define the following terms:
   a. gutter
   b. facia
   c. flashing
   d. ridge
   e. pitch
   f. shakes
   g. valley
   h. square of shingles
   i. cap coverage
   j. asphalt
   k. eave
   l. exposure
   m. building paper
   n. head lap
   o. hip
   p. vapor barrier
   q. mansard
   r. slide lap
   s. valley tin
   t. roll roof
   u. shingle butt
   v. dormer insulation
   w. rake
   x. weight and quality
   y. sheathing

3. Study Residential Carpentry, Unit I, "Roofing Materials," Transparency 1, page 11-1. Be prepared to take an illustration showing a roof with numbers marked on the various components and identify each component either orally or in writing to a fellow student. Check each others responses.

4. Given several roof plans you will estimate all materials needed to cover the roof. Check your estimate with an instructor prepared list.

5. Using available references draw and indicate how you would lay the first two rows of shingles on a roof. Have the instructor check your work.

6. Using illustrations draw and indicate where flashing is installed on a roof. The instructor will check your work.

7. Have the instructor assign a roofing project to you and another student. Complete the following steps. Have the instructor check your work after each step.
   a. Estimate and obtain all necessary materials and supplies.
   b. Lay out and mark all materials.
   c. Cut and install all materials and check to determine if your work meets the criteria listed in the Performance Objective.

Criterion Evaluation:

The instructor will assign a roofing project in which you will lay out, mark, cut, and install that portion of the roof designated by the instructor. All materials and tools required to complete the project will be supplied at your request. The instructor will designate the time to complete the activity. You will work with another student and both of you will receive credit for the Performance Objective when the following criteria are met:

1. All work is completed according to specifications and plans.
2. All materials are cut within 1/8" and nailed securely.
3. All work is aligned.
4. All work is completed in designated time
5. All power tools used in accordance with shop safety rules.

STUDENT COMPETENCY SHEET

Unit: 03 Carpentry

Competency Statement: 10 Installs windows

Performance Objective: 01 Given floor plans with a window schedule and all specifications, you will install those windows designated by the instructor. All necessary materials, tools and equipment will be furnished at your request. The instructor will designate the amount of time for the work. You must install at least two different types of windows to receive credit for this Performance Objective. The following criteria must be met:

1. All work is completed in accordance with specifications and plans.
2. All work is square, plumb, and level.
3. All work is securely fastened within 1/16".
4. All work is completed in the designated time.

Learning Activities:

1. Read Modern Carpentry, pages 215-248. Answer questions 1-16 on page 247. Have your written answers check by the instructor.

2. Using available references, define the following terms and record them in your notebook.

a. stops	i. double-hung	q. muntin
b. apron	j. single-hung	r. mullion
c. dormer	k. casement	s. casing
d. bay	l. awning	t. jamb
e. transom	m. hopper	u. head
f. swinging	n. multi-use	v. stool
g. sliding	o. fin	w. sash
h. fixed	p. drip cap	x. sill

With a fellow student practice defining each term until you can define all terms.

3. Attend a lecture/demonstration on the installation of the double-hung window in a wood setting. List in your notebook all procedures used in the demonstration. Be prepared to demonstrate and explain any of these steps when so directed by the instructor. Also, be prepared to evaluate another student's demonstration.

4. Obtain a floor plan and specifications and install the double-hung window designated by the instructor. Complete the assignment using the following steps:
   a. Read the plan and obtain all the necessary tools and materials.
   b. Prepare the rough opening.
   c. Install the window and evaluate your work according to the standards listed in the Performance Objective.

   After each step have your work checked by the instructor before continuing to the next step.

5. Attend a lecture/demonstration on the installation of a casement type window in a (block wall). List in your notebook all the procedures used in the demonstration. Be prepared to demonstrate and explain any of these steps when so directed by the instructor. Also, be prepared to evaluate another student's demonstration.

6. Obtain a floor plan and specifications and install a casement type window in a (block wall) designated by the instructor. Complete the assignment using the following steps:
   a. Read the plan and obtain the necessary tools and materials.
   b. Prepare the rough opening.
   c. Install the window and evaluate your work according to the standards listed in the Performance Objective.

   After each step, have your work checked by the instructor before continuing to the next step.

Criterion Evaluation:

The instructor will furnish you with a floor plan showing a window schedule and specifications. All tools, materials and equipment needed will be furnished at your request. You will install a double-hung window in a wood wall and a casement window in a block wall. You must install both types in order to receive credit for this Performance Objective. The installations must be completed according to the following criteria:

1. All work is completed in accordance with specifications and plans.
2. All work is plumb, level and square.
3. All work is securely fastened within 1/16".
4. All work is completed in the designated time.

STUDENT COMPETENCY SHEET

Unit: 03 Carpentry

Competency Statement: 11 Installs outside doors (includes garage doors)

Performance Objective: 01 Given a door schedule, floor plan tools, materials, equipment and specifications, you will install the doors designated by the instructor. The instructor will designate the time to be allowed for completion of the work. You will receive credit for the task when the following criteria are met:

1. All work is completed in accordance with specifications.
2. All work is square, plumb and level.
3. All work is completed in the designated time.

Learning Activities:

1. Read Modern Carpentry, pages 238-247. Answer questions 1-4 and 15-19. The instructor will check your written answers.

2. Using available references define the following terms and record them in your notebook. Have a student check your work.

a. butt hinge	i. trim	p. hollow core
b. casing	j. blocking	q. sill
c. clearance	k. door	r. swings
d. door frame	l. stop	s. dimensions
e. head-jamb	m. rough headers	t. thickens
f. jig	n. trim stud	u. exterior
g. side-jamb	o. solid core	
h. threshold		

3. Using available references complete the following items:
   A. List the three parts of a door.
   B. List the different types of exterior designed doors.
   C. List major types of garage doors.

4. Attend a lecture/demonstration by the instructor on installing outside doors. List step-by-step the procedures demonstrated for installing an outside door, which will include a garage door.

5. Given the specifications and door schedule you will install an outside door. You must follow step-by-step the procedures you listed in Activity 4. All work must meet the criteria set forth in the performance objective.

Criterion Evaluation:

The instructor will furnish you with the following items and designate the time for completing the activity.

1. Door schedule
2. Floor plan and specifications
3. Tools, materials and equipment

Using the above items you will install those outside doors indicated by the instructor. To achieve credit for the performance objective you must meet the following criteria:

1. All work must be completed in accordance with specifications.
2. All work is square, plumb and level.
3. All work completed in a designated time.

STUDENT COMPETENCY SHEET

Unit: 03 Carpentry

Competency Statement: 12 Installs sheathing and exterior walls

Performance Objective: 01 Given building plans and specifications you will lay out, mark, cut, and install all sheathing and side wall finish or that portion designated by the instructor. All materials, tools and equipment will be supplied at your request. The instructor will designate the time allotted for the work. You will work with another student. Both will receive credit for the performance when the following criteria are met:

1. All work is in accordance with specifications and plans, with all material cut and joined within 1/8".
2. All work is completed within the designated time.
3. All work is square, plumb, level and securely fastened.
4. All power tools are used in accordance with shop safety rules.

Learning Activities:

1. Read Modern Carpentry, Unit 12, pages 249-276. Answer questions 1-16 on pages 274-275. Have the instructor check your work.

2. Read Residential Carpentry, pages 63-1 through 67-1, and Modern Carpentry, pages 249-276. List and define the following terms.
   a. exterior finish
   b. rake
   c. batten
   d. shiplap
   e. tongue and groove
   f. bevel siding
   g. fascia board
   h. ledger
   i. overhang
   j. plancier
   k. brick mold
   l. louvered
   m. aluminum siding
   n. drop siding
   o. wood shakes
   p. rustic siding
   q. prime siding
   r. clapboard
   s. bargeboard
   t. lookouts
   u. gypsum siding
   v. cornice (open, closed or boxed)
   w. frieze
   x. fascia
   y. soffit
   z. furring strip
   aa. crown molding
   bb. cove mold
   cc. bed mold
   dd. asbestos shingle

After recording the terms and definitions, complete a test in which you will match the terms with the correct meaning. Have the instructor check your work.

3. Using available references, list the five main types of sheathing and explain the usage of each. Have the instructor check your work.

4. Attend a lecture and demonstration given by the instructor on sheathing and exterior wall installations. List, step-by-step the procedures used in installing sheathing and exterior walls. Be prepared to answer orally questions the instructor may ask.

5. Given a building plan and specifications, lay out, mark, cut and install sheathing and exterior walls on a shop demonstrator unit designated by the instructor. You will work with another student. The instructor will check your work.

Criterion Evaluation:

Given building plans and specifications, you will lay out, mark, cut and install sheathing and side wall finish or that portion designated by the instructor. All materials, tools, and equipment will be supplied at your request. The instructor will designate the time allotted for the work. You will work with another student. Both will receive credit for the performance when the following criteria are met:

1. All work is in accordance with specifications and plans, with all material cut and joined within 1/8".
2. All work is square, plumb, level and securely fastened.
3. All work is completed within the designated time.
4. All power tools are used in accordance with shop safety rules.

STUDENT COMPETENCY SHEET

Unit:	03	Carpentry
Competency Statement:	13	Installs insulation
Performance Objective:	01	Given building plans and specifications with the insulation schedule you will install that portion of the insulation designated by the instructor. All materials, tools and equipment will be furnished at your request. The instructor will designate the time allowed for completion of the task. There will be no open cracks in the completed work, and all joints will be overlapped except where structure materials prevent overlapping (such as where there is a double header).

Learning Activities:

1. Read Modern Carpentry, pages 277-305. Answer questions 1-20 on page 304 and "Outside Assignment" 1. Have the instructor check your answers.

2. Using available references, define the following terms and place them in your notebook. With a student, practice identifying these terms until you can explain all terms correctly, as verified by the instructor.
   a. thermal insulation
   b. heat transference
   c. bats
   d. blanket
   e. conduction
   f. convection
   g. insulation
   h. loose fill
   i. radiation
   j. fiber glass
   k. rock wool
   l. polystyrene foam
   m. rigid insulation
   n. ceiling fill
   o. floor insulation

3. Attend a lecture/demonstration on insulation. Record the installation procedure in your notebook. You will be tested on how each step is accomplished and why each step is important.

4. Obtain an order to insulate an area of a structure from the instructor. Give an estimate of materials needed and have the instructor check your estimate. After obtaining an accurate estimate of materials, obtain all materials, tools and equipment required to install the insulation. Then install the insulation. Ask questions any time you have difficulty. The instructor will evaluate your work.

Criterion Evaluation:

Given building plans and specifications with the insulation schedule, you will install that portion of the insulation on the schedule designated by the instructor. All materials, tools and equipment will be furnished at your request. The instructor will designate the time allowed for completion of the task. There will be no open cracks in the completed work, and all joints will be overlapped except where structual materials prevent overlapping (such as where there is a double header).

STUDENT COMPETENCY SHEET

Unit: 03 Carpentry

Competency Statement: 14 Installs framing for other trades

Performance Objective: 01 Given plans and specifications for a residential building, you will identify the areas where pre and post framing for other trades is necessary and install that portion designated by the instructor. All tools and materials will be supplied at your request. The criteria listed below must be met to receive credit for this objective.

1. All work is completed within the time designated by the instructor.
2. All work is square, level and plumb.
3. All work is securely fastened and within +1/8" of being in accord with plans and specifications.
4. All areas where pre and post framing is required are identified.

Learning Activities:

1. Attend a lecture/demonstration on framing for other trades. Record in your notebook the procedures for identifying where pre and post framing will occur, and how to frame either temporarily or permanently for other trades. Your notebooks will be checked by the instructor.

2. Review competencies 02, 03, 04, 05, 06, 07, and 08 of this unit. These competencies and their learning activities will help to identify what framing is required for other trades. Make a check list of the terms used in these competencies that relate to pre and post framing. The instructor will check your list.

3. Obtain a complete set of residential plans and specifications. Identify and list all required pre and post (temporarily or permanently) framing. Compare your list with one prepared by the instructor.

4. Obtain a set of plans (or use the ones from the above Learning Activity). Identify four areas where framing is required for other trades. Draw a detailed sketch of the framing for each of these areas. Have the instructor evaluate your sketches.

5. Obtain a set of plans and complete any required pre and post framing in those areas designated by the instructor. Have the instructor check your work.

Criterion Evaluation:

Given a set of plans and specifications for a residential structure, you will be required to complete the following tasks:

1. Identify all areas where pre and post framing for other trades is required.
2. Install all areas of framing designated by the instructor. (This task will be completed only if task 1 is completed successfully.)

All required tools and materials will be supplied at your reqpest. Your performance must meet the following criteria:

1. All work is completed within the time designated by the instructor.
2. All work is square, level and plumb.
3. All work is securely fastened and within +1/8" of being in accord with plans and specifications.
4. All areas where pre and post framing is required are identified.

STUDENT COMPETENCY SHEET

Unit:	03	Carpentry
Competency Statement:	15	Installs dry wall, lathing for plaster and paneling
Performance Objective:	01	Given a floor plan with a finishing schedule and specifications, you will install those dry wall sections designated by the instructor. All required materials, tools and equipment will be supplied at your request. All installed materials must not have joint openings exceeding 1/8". All vertical nailing on butt joints must be spaced between 4" to 5". All vertical nailing on common joints must be set so that all heads are below the surface of the dry wall without breaking the outer layers of material. You must complete all work within the allotted time without damaging any materials. Another student may assist you on any overhead work, however, the student may not offer any technical assistance.

Learning Activities:

1. Read Residential Carpentry, 37-J through 69-J. Complete the test on 65-J through 67-J. Also read Modern Carpentry, pages 307-330. Take the test on page 330, 1-18. The instructor will check your written responses.

2. Using available references define the following terms and record them in your notebook for future reference. With a fellow student, practice identifying the terms until you can define each correctly. Verify each others answers.
   a. backing strips
   b. dimple
   c. dry wall
   d. featheredge
   e. gypsum board
   f. joint
   g. joint cement
   h. perfa-tape
   i. topping
   j. annular ring nails
   k. square edge
   l. tappered edge
   m. metal corners
   n. finish trowel
   o. coated nails
   p. lath hatchet
   q. utility knife
   r. wallboard jacks
   s. ceiling tees
   t. joint knife
   u. corner tool

3. Attend a lecture/demonstration on installing dry wall. List step-by-step the activities of the demonstration in your notebook. Be prepared to discuss the various steps. The instructor will check your notes.

4. Obtain a finish schedule and make an estimate of material needed to dry wall that portion of the schedule assigned you by the instructor. After your estimate has been checked, procure the material and proceed to complete the assignment. Your instructor will check your work.

Criterion Evaluation:

The instructor will furnish you with a finishing schedule and specifications and require you to install the dry wall for a designated section(s) of the floor plan. All materials, tools and equipment will be supplied at your request. All installed material must not have joint opening exceeding 1/8". All vertical nailing on butt joints must be spaced between 4" to 5". All vertical nailing on common joints must be double nailed with 8" spacing (±1/2"). All nails must be set so that all heads are below the surface of the dry wall without breaking the outer layers of the material. You must complete all work within the time allotted by the instructor without damaging any materials. Another student may assist on overhead work.

STUDENT COMPETENCY SHEET

Unit:	03	Carpentry
Competency Statement:	16	Installs finished floors
Performance Objective:	01	Given a floor plan with a finishing schedule and specifications, you will install the finish flooring portions designated by the instructor. All materials, tools and equipment needed will be furnished at your request. The instructor will designate the time allowance according to the type of installation he assigns. To receive credit for this objective you must complete the installation of the following types of floors: 1. Hardwood 2. Tile (asbestos, vinyl, etc.) 3. Carpet (on flat surfaces only) Each installation must meet the following criteria: 1. All work must be in accordance with specifications and plans. 2. All materials cut and joined and within 1/16", trade standards, or manufacturer's recommendations. 3. All work is square and level. 4. All power tools used in accordance with shop safety rules. 5. All work is completed in the designated time.

Learning Activities:

1. Read Modern Carpentry, pages 331-346. Answer the questions on page 345 and do "Outside Assignment." The instructor will check your responses.

2. Using any available references define the following terms and record them in your notebook for future reference. With a fellow student practice identifying these terms until you can define each correctly. The instructor will check your work.

a.	underlayment	l.	tile flooring	w.	asphalt
b.	resilient flooring	m.	linoleum	x.	rubber
c.	strip flooring	n.	rugs	y.	vinyl
d.	adhesive	o.	carpet	z.	cork
e.	end-matched	p.	mosiac-wood	aa.	plywood
f.	mastic	q.	block	bb.	particle board
g.	masonite	r.	hardboard	cc.	15#felt
h.	chalkbox	s.	nail set	dd.	framing square
i.	layout	t.	linoleum knife	ee.	squaring
j.	tile cutter	u.	carpet stretcher	ff.	nailing strip
k.	awl	v.	sewing awl		

3. Attend a lecture/demonstration on installing hardwood flooring. List step-by-step the activities of the demonstrator and record them in your notebook. Be prepared to discuss any part of the demonstration and perform manually the work demonstrated, at the instructors request.

4. Obtain a floor plan calling for an oak strip matched-end floor. You will, after inspection of the sub-floor, add one thickness with 6" overlap per run of 15# building left paper, place a 1/2" spacer board on the starting side and two ends and begin laying and nailing the strip flooring. All joints must be within 1/16" and nailed securely. The instructor will check your progress.

5. Obtain a floor plan calling for vinyl tile, 12 x 12 square. Clean the floor, set all nails, patch holes, lay out from center in four directions, spread adhesive on one quarter, then start the tile. The instructor will check your progress.

6. Obtain a floor plan calling for wall to wall carpet. Install all nailer strips and install the underlayment and then install the carpet. Be sure to stretch all sags and irregularities down smooth and all exterior edges down tight on the nail strips.

Criterion Evaluation:

The instructor will furnish you with a finishing schedule and specifications for the installation of finish flooring. The instructor will designate portions of three different types of floors shown in the schedule. You will install the portion or portions of flooring as assigned. To receive credit for this object you must complete the three installations. Each installation must meet the following criteria:

1. All work must be in accordance with specifications and plans.
2. All materials cut and joined within 1/16", trade standards or manufacturer's recommendations.
3. All work is square and level.
4. Power tools used in accordance with shop safety rules.
5. All work completed in the designated time.

STUDENT COMPETENCY SHEET

Unit: 03 Carpentry

Competency Statement: 17 Installs doors and interior trim

Performance Objective: 01 Given floor plans with a door and trim schedule containing all specifications, you will install the doors and interior wood trim or that portion designated by the instructor. All necessary tools, materials and equipment will be furnished at your request. The instructor will designate the amount of time to be allowed for the work. The following criteria must be met:

1. All work is completed in accordance with specifications and plans.
2. All work is square, plumb and level.
3. All work is securely fastened and within 1/16".
4. All work is completed in the designated time.
5. No materials are damaged in the installation process.

Learning Activities:

1. Read Modern Carpentry, pages 361-382. Answer questions 1-15, page 382. Have your written answers checked by the instructor.

2. Using available references, define the following terms and record them in your notebook. With a fellow student, practice defining each term until you can correctly define all terms.

a. apron	n. quarter round	aa. lock set
b. baseboard	o. side jamb	bb. corner molding
c. base shoe	p. stool	cc. passageway
d. butt	q. template	dd. style
e. casing	r. threshold	ee. window trim
f. clearance	s. trim	ff. 45° miter
g. cope	t. bi-fold	gg. swing
h. cove molding	u. back band	hh. solid core
i. door frame	v. keyed	ii. hollow core
j. gain	w. casing nail	jj. bed molding
k. head jamb	x. blocking	kk. privacy
l. jig	y. rough header	ll. brand
m. miter joint	z. trimmer stud	mm. return

3. Attend a lecture/demonstration on interior door installations which will include: regular, pre-hung regular, and bi-fold. List in your notebook all procedures used in the demonstrations. Be prepared to demonstrate and explain these steps when so directed by the instructor. Also, be prepared to evaluate another student's demonstration.

4. Obtain a floor plan with a door schedule and all specifications. Install the doors demonstrated in Learning Activity 3. To complete this assignment, you must use the following steps:
   a. Read the plan and obtain necessary tools and materials.
   b. Prepare rough openings.
   c. Install the doors according to the steps contained in your demonstration notes.
   d. Observe all standards for the Performance Objective.

   After you complete each step, have your work checked by the instructor before continuing to the next step.

Criterion Evaluation:

Given floor plans with door and trim schedule containing all specifications, you will install the doors and interior wood trim or that portion designated by the instructor. All necessary tools, materials and equipment will be furnished at your request. The instructor will designate the amount of time to be allowed for the work. The following criteria must be met:

1. All work is completed in accordance with specifications and plans.
2. All work is square, plumb and level.
3. All work is securely fastened and within 1/16", except miter joints.
4. All work is completed in the designated time.
5. No materials are damaged in the installation process.

STUDENT COMPETENCY SHEET

Unit:	03	Carpentry
Competency Statement:	18	Installs cabinets and fixtures
Performance Objective:	01	Given plans and specifications for all cabinets and fixtures that are to be installed, you will install all cabinets and fixtures or that portion designated by the instructor. All necessary tools, materials and equipment will be furnished at your request. The instructor will designate the amount of time for the work. References required by the specifications may be used. The following criteria must be met to receive credit for this Performance Objective: 1. All work is completed in accordance with the specifications and plans. 2. All work is square, plumb and level. 3. All work is securely fastened and within ± 1/16" of the specifications. 4. All work is completed within the designated time. 5. All work is completed without any damage to cabinets or fixtures.

Learning Activities:

1. Read Modern Carpentry, pages 383-406. Answer questions 1-12, page 406. Have your answers checked by the instructor. Place them in your notebook for future reference.

2. Using available references, define the following terms and record them in your notebook.

a. appliance
b. counter unit
c. cabinet hardware
d. knob
e. plastic laminates
f. pull
g. rail
h. stile
i. toe space
j. wall cabinets
k. base cabinets
l. drawer guides
m. shelf supporters
n. shelves
o. back splash
p. soffit
q. plate rail
r. cup hangers
s. lipped
t. flush
u. surface
v. surface hinges
w. concealed hinges
x. raised panel
y. plywoods
z. friction catch
aa. magnetic catch
bb. cottage latch
cc. mitered joints
dd. monorail guides
ee. dado joint
ff. off-set hinge
gg. butt joints
hh. coped joints
ii. rabbet joints

3. Sketch a typical cabinet with two doors and two drawers from base up including an unfinished particle board top. All parts should be identified by their proper names. You will detail for fabrication purposes, and for identification purposes.

4. Attend a lecture/demonstration on cabinetry and fixtures which will include basic cabinetry, factory made installations and speciality items. All procedures used and discussed during these lecture/demonstrations will be recorded in your notebook. Be prepared to perform (or at the instructors request) any portions of the demonstration and to explain the procedures as you demonstrate.

5. Have your instructor assign a cabinet or fixture which requires installation. Following the plans and specifications for installation, install the designated item. If you have difficulty, consult available references. If you cannot solve your problem with these references, consult the instructor. Evaluate your work by the criteria in the Performance Objective. After the instructor approves your work, complete another installation following the same process.

6. Complete the Criterion Evaluation. If you successfully complete the evaluation, begin the next Performance Objective. If not, repeat those learning activities designated by the instructor.

Criterion Evaluation:

Given plans and specifications for all cabinets and fixtures that are to be installed, you will install all cabinets and fixtures, or that portion designated by the instructor. All necessary tools, materials and equipment will be furnished at your request. The instructor will designate the amount of time for the work. The following criteria must be met to receive credit for the Performance Objective:

1. All work is completed in accordance with the specifications and plans.
2. All work is square, plumb and level.
3. All work is securely fastened and within $\pm$ 1/16" of the specifications.
4. All work is completed within the designated time.
5. All work is completed without any damage to cabinet or fixtures.

STUDENT COMPETENCY SHEET

Unit:	03	Carpentry
Competency Statement:	19	Identifies sizes and shapes of footers needed and lays out and sets grade stakes for a footer according to given specifications.
Performance Objective:	01	Given a set of plans, demonstrate your ability to lay out footer lines, erect forms and bulkheads and set grade stakes. Tools and material will be furnished.

Learning Activities:

1. Using as a reference Modern Carpentry, pages 90-93, and Masonry Simplified, Volume 2, pages 53-58:
   a. List the types of footers listed.
   b. What determines the size and shapes of footers.
   c. Given a list of questions by the instructor, answer each one to the best of your knowledge.

Criterion Evaluation:

Given a set of plans, demonstrate your ability to lay out footer lines, erect forms and bulkheads and set grade stakes.

1. Safety regulations observed at all times.
2. Instructor will observe and evaluate your work.

STUDENT COMPETENCY SHEET

Unit:	03	Carpentry
Competency Statement:	20	Lays out and installs ceramic tile
Performance Objective:	01	Given the specifications, you will lay out, mark, cut and install tile and fixtures. All necessary tools, equipment and materials will be furnished. 1. You will observe all safety regulations. 2. All work done to specifications. 3. Use all references available.

Learning Activities:

1. Look up information on adhesives and define each of the following:
   a. Latex
   b. Water resistant
   c. Water proof

2. Attend a demonstration on grouting. Be sure you understand each of the following steps:
   a. Mixing of grout should be done according to manufacturer's specifications.
   b. Application of grout
      1. Methods of application, sponge, float
   c. Cleaning the wall
      1. Sponge and Water
      2. Polishing and waterproofing (silicone)

3. Practice laying out, cutting and installing ceramic tile.

Criterion Evaluation:

Given the specifications you will lay out, mark, cut, and install tile and fixtures. All tools, equipment and materials will be furnished.
1. All safety regulations will be observed.
2. Instructor will observe and evaluate your work.

STUDENT COMPETENCY SHEET

Unit:	03	Carpentry
Competency Statement:	21	Identifies types and uses of paints
Performance Objective:	01	Demonstrate your ability to interpret the types and uses of paints designated by the instructor. Observe all safety rules and regulations specified by the manufacturer.

Learning Activities:

1. Identify types of paints.
   a. Oil base and latex for (wood) interior and exterior uses.
   b. Alkyd, for masonry and wood.
   c. Lacquers and enamels for metal.
   d. Primers

2. List the types of paints and their uses found in your shop.

3. List proper thinning and cleaning agents for the types of paint used in your shop.

Criterion Evaluation:

Demonstrate your ability to interpret the types and uses of paints designated by the instructor.

1. Observe all safety rules and regulations specified by the manufacturer.
2. Proper use and cleaning of brushes.
3. Your work will be observed and evaluated by the instructor.

STUDENT COMPETENCY SHEET

Unit:	03	Carpentry
Competency Statement:	22	Identifies types and installs gutters, down spouts and fittings
Performance Objective:	01	Given a demonstration and manufacturers suggestions, you will install a given amount of gutter, down spouts and fittings. All safety regualtions should be observed.

Learning Activities:

1. Using Modern Carpentry, pages 211-212, as a reference, list the types of gutters, down spouts, and fittings.

2. Estimate materials needed and list tools and equipment to complete the job.

Criterion Evaluation:

Given a demonstration and manufacturers suggestions, you will install a given amount of gutters, down spouts and fittings.

1. All safety regulations should be observed.
2. Check for leaks.

STUDENT COMPETENCY SHEET

Unit:	03	Carpentry
Competency Statement:	23	Identifies different types of moisture barriers and methods of water proofing drains.
Performance Objective:	01	Using available reference materials, list types and uses of moisture or vapor barriers and methods of water proofing.

Learning Activities:

1. Using Modern Carpentry, pages 91, 104-105, Masonry Simplified, Volume 2, pages 123-133, as references determine types of materials used for water proofing drains.

2. Conduct field trip to observe the installation of water proofing drains and vapor barriers.

Criterion Evaluation:

After conducting a field trip, the instructor will give a test of observation on water proofing drains and vapor barriers.

STUDENT COMPETENCY SHEET

Unit:	03	Carpentry
Competency Statement:	24	Identifies three types of septic systems
Performance Objective:	01	Given installation specifications, install a complete septic system according to your local Health Department regulations, if practical.

Learning Activities:

1. Conduct a field trip to observe the installation of a septic system.

2. Use Masonry Simplified, Volume 2, pages 365-390 as a reference.

Criterion Evaluation:

After conducting a field trip to observe the installation of a septic system, the instructor will test and evaluate your work.

STUDENT COMPETENCY SHEET

Unit:	03	Carpentry
Competency Statement:	25	Applies ceiling finish
Performance Objective:	01	Given a plan and manufacturers specifications, you will determine the materials, tools and equipment needed to install a given type of ceiling in a given area. 1. Safety rules should be observed.

Learning Activiites:

1. Using as a reference, Modern Carpentry, pages 323-331, you will identify and list the different types of ceilings illustrated.

2. Conduct a field trip and observe different types of ceiling finish being applied.

Criterion Evaluation:

Given a plan and manufacturers specifications, you will determine the material, tools and equipment needed to install a given type of ceiling in a given area.

1. All safety regulations will be observed.
2. The isntructor will observe and evaluate your work.

STUDENT COMPETENCY SHEET

Unit:	04	Masonry
Competency Statement:	01	Identifies and states the usage of tools and equipment for residential masonry work
Performance Objective:	01	Shown a display of tools and equipment common to residential brick and rock masonry, you will identify and state the usage of each item. All identifications must be in agreement with a previously prepared answer key, and all usage statements must be consistent with available references.

Learning Activities:

1. Read Masonry Simplified, Volume 1, pages 29-44. Make a list of all masonry tools and equipment listed on these pages. Check your list with your instructor.

2. From the reading assignment in Learning Activity 1, list in your notebook the usage of all tools and equipment. Additional references may be used. The instructor will check your list.

3. Attend a demonstration on the identification and usage of masonry tools and equipment. Ask questions on any item that is not clear to you.

4. Given a task to perform which directly involves masonry, list, in order those tools and equipment that are needed to perform this task. Your instructor will check your responses.

5. Working with another student, take your list of tools and go to the tool display board and practice identifying each tool. This may be done by selecting, pointing to, or touching the tool called for. Verify each other's answers. If there is disagrement concerning any response, check with your instructor.

Criterion Evaluation:

The instructor will display a group of tools and equipment used in residential masonry work. Each item will be numbered. List the numbers on a sheet of paper and after each number write the name of the corresponding piece of equipment and describe its use. You must identify all items and list at least one use of each. All identifications must agree with a previously prepared answer key, and all statements on usage must agree with available reference material. You must complete all responses.

STUDENT COMPETENCY SHEET

Unit:	04	Masonry
Competency Statement:	02	Identifies standard bricks and blocks used in masonry construction
Performance Objective:	01	Shown basic bricks used locally and standard concrete or cinder blocks used in local residential masonry, you will identify each and state the nominal sizes of each. You must make all required identifications, and all responses must agree with a prepared answer key. You will have time to complete all responses.

Learning Activities:

1. Read General Architectural Drawing, pages 88-89. Answer questions 1-32, pages 99-100. Also, read Architecture, pages 216-221, and answer questions 12-23 on page 221. The instructor will check your work.

2. Using available references, define each of the following terms and record them in your notebook. With another student, practice identifying the terms until you can define each correctly. Verify each other's answers.

a. veneer	k. wire cut	u. standard
b. terra cotta	l. glazed	v. modular
c. attaching	m. cinder block	w. header
d. sythe	n. velour	x. soldier
e. sailor	o. concrete block	y. shiner
f. lintel block	p. fire brick	z. stacked
g. row lock	q. mortar	aa. corner
h. arches	r. Norman	bb. leads
i. capillary	s. Roman	
j. silicone	t. stretcher	

3. Attend a lecture/demonstration on brick and block identification and uses. Following the presentation, the instructor will display a number of bricks and blocks and will require you to identify each by manufacturer's name and to state the nominal size of each.

Criterion Evaluation:

The instructor will display four basic bricks and five standard building blocks which are used in local construction. Each brick or block will be numbered. On a sheet of paper, list each number and next to the number write the name of the brick or block and list the nominal size. You must identify all items as to name and size. All responses agree with a prepared answer key and must be completed.

STUDENT COMPETENCY SHEET

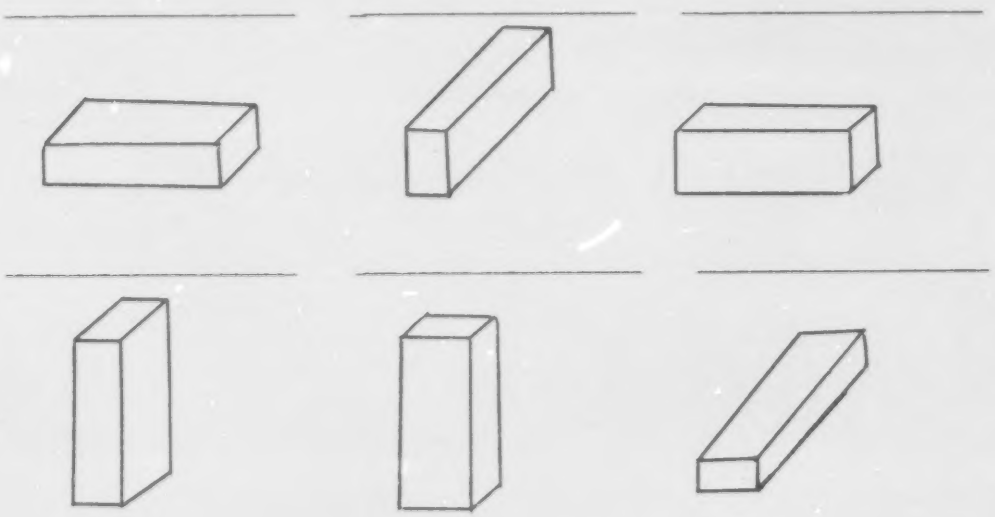
Unit:	04	Masonry
Competency Statement:	03	Identifies six brick positions and designs in a building
Performance Objective:	01	Shown illustrations of six brick positions in a wall, you will identify each position. Also, you will construct a wall section which illustrates each of the positions. Your wall must contain from four to six bricks in each course. You must identify all positions shown, and you must construct a wall section of each position that agrees with available references. You will complete all work.

Learning Activities:

1. Read Architecture Residential Drawing and Design, pages 221-222. Observe Figure 12-28. Make a drawing of the six brick positions and label each.

2. Observe several brick walls in your area. See if you can find any two of the six brick positions.

3. For the following illustrations, write the name of the brick position in the blank provided. Attempt this task without the use of references.



4. On a separate sheet of paper,draw, by using each of the six brick positions as a course, a wall in the order listed:
   1st Soldier
   2nd Stretcher
   3rd Header
   4th Rolok
   5th Shiner
   6th Sailor

5. Complete the Criterion Evaluation. If you successfully complete the evaluation, begin the next objective. If not, repeat the learning activities designated by the instructor.

Criterion Evaluation:

The instructor will display, by illustrations, the six brick positions in a building. Each will be numbered. Beside each number write the correct name of the position. Construct a composite wall section using each of the six positions. Use from four to six bricks to each course. You will have _____ minutes to complete this activity.

Your wall section must display all posistions with each position labeled and must be in agreement with available references.

STUDENT COMPETENCY SHEET

Unit:	04	Masonry
Competency Statement:	04	Identifies masonry symbols used on blueprints
Performance Objective:	01	Given a set of blueprints that contain a typical wall section and a typical window section, you will identify all symbols relating to masonry work. You must list all masonry materials required in each section and all responses must agree with available references.

Learning Activities:

1. Read pages 169-172 and page 183 in Architecture Residential Drawing and Design. Make a set of flash cards of the masonry symbols listed in this reading assignment. Your instructor will check your work.

2. Practice with another student identifying the symbols you listed in Learning Activity 1.

3. Read Masonry Simplified, Volume 1, pages 254-273.

4. Obtain a set of blueprints from your instructor. Make a list of all masonry symbols you find on this blueprint. Beside each symbol, write the interpretation of that symbol. Your instructor will check your list.

Criterion Evaluation:

Given a set of blueprints that contain a typical wall section and a typical window section, you will identify all symbols relating to masonry work. You must list all masonry materials required in each section and all responses must agree with available references.

STUDENT COMPETENCY SHEET

Unit:	04	Masonry
Competency Statement:	05	Lays up stretcher wall between established leads
Performance Objective:	01	Given access to the necessary tools and materials, you will lay up a 4" brick and an 8" block stretcher wall between established leads while maintaining the following: 1. 3/8" to 1/2" mortar between each brick and block lengthwise. 2. ± 1/8" for overall height for a given number of courses and wall height. 3. All brick and block laid to a line. 4. All brick and block plumb and level within 1/8". 5. Mortar mixed per manufacturer's specifications. 6. All work completed within the time allotted by the instructor. 7. All tools and equipment cleaned.

Learning Activities:

1. Read pages 58-59 in Masonry Simplified, Volume 1. List all steps and tools needed to mix mortar. Have your instructor check your list.

2. Given a bag of mortar, list the procedure the manufacturer recommends for its mixing. Show this procedure to your instructor.

3. Attend a demonstration on how to mix mortar. List the steps and tools needed, and compare your list with the one you compiled in Learning Activity 1. Using your list of procedures, obtain the necessary tools and materials and mix a batch of mortar per manufacturer's specifications. Your instructor will observe you as you complete this activity.

4. Read pages 73-75 in Masonry Simplified, Volume 1. Write on a separate sheet the steps in the procedure for spreading mortar.

5. Attend a demonstration on spreading mortar. Take notes and ask questions on anything not clear to you. Be prepared to demonstrate how to spread mortar on bricks and blocks when so directed by the instructor.

6. Attend a demonstration on laying brick between two leads. Take notes and ask questions on items not clear.

7. Obtain the necessary materials and tools, and in an area designated by the instructor, lay a 4" brick stretcher wall between established leads while maintaining the following:
   a. 3/8" to 1/2" head joints.
   b. ± 1/8" for overall height.
   c. All bricks laid to a line.
   d. Mortar mixed per manufacturer's specifications.
   e. All brick plumb and level within 1/8".

8. Attend a demonstration on laying block between two leads. Take notes and ask questions on items not clear.

9. Obtain the necessary materials and tools, and in an area designated by the instructor, lay a 4" brick stretcher wall between established leads while maintaining the following:
   a. 3/8" head joints.
   b. + 1/8" for overall height.
   c. All block laid to a line.
   d. Mortar mixed per manufacturer's specifications.
   e. All block plumb and level within 1/8".

Criterion Evaluation:

Given access to tools and materials, lay up a 4" brick wall between established leads and an 8" block wall between established leads whild maintaining the following:
   a. 3/8" to 1/2" mortar joints on brick and 3/8" on block.
   b. ± 1/8" for overall wall height.
   c. All brick and block laid to a line.
   d. Mortar mixed per manufacturer's specifications.
   e. All brick and block plumb and level within 1/8".
   f. All work completed within the allotted time by the instructor.
   g. All tools and equipment cleaned.
   h. Wall will be completed per drawing specifications.

STUDENT COMPETENCY SHEET

Unit:	04	Masonry
Competency Statement:	06	Lays up a 4" and an 8" block return corner
Performance Objective:	01	Given access to all necessary plans, tools and materials, you will lay up a 4" brick and an 8" block return corner, maintaining the following criteria: 1. 3/8" to 1/2" mortar joint. 2. ± 1/8" for overall wall height. 3. Corner square within 1/16". 4. Corner plumb and level within 1/8". 5. Mortar mixed per manufacturer's specifications. 6. All work completed within the time allotted by the instructor. 7. All tools and equipment cleaned. The portion of the corner to be laid will be designated by the instructor. However, the designated portion may not be less than 4' in height or less than 80" in each direction or extended to the nearest opening. All tools, equipment, and materials will be supplied at your request.

Learning Activities:

1. Read pages 47-48 in The Practical Handbook of Concrete and Masonry. As you read this material, take notes and write a short summary describing how to start and lay a return corner. Use sketches to assist in your explanation. Your instructor will check your work.

2. You should now have an idea of the procedure for laying up a 4" brick corner. Obtain 21 bricks, and without using mortar, lay out a 4" corner which has four blocks at the starter course. Your instructor will check your work.

3. Attend a demonstration on laying up a 4" brick return corner. Take notes and ask questions about anything not clear to you. The instructor will check your notes.

4. Lay up a 4" brick return corner, maintaining the criteria listed in the Performance Objective.

5. Read pages 61-66 in The Practical Handbook of Concrete and Masonry. Explain in your own words how to lay out a return corner with 8" blocks. Your instructor will check your work.

6. Obtain 21 blocks, and, without using mortar, lay out an 8" return corner which has four blocks at the starter course. Your instructor will check your work.

7. Attend a demonstration on laying up an 8" block corner. Take notes and ask questions about anything not clear to you. The instructor will check your notes.

8. Lay up an 8" block return corner, maintaining the criteria listed in the Performance Objective:

Criterion Evaluation:

Given access to all necessary plans, tools and materials, you will lay up a 4" brick and an 8" block return corner, maintaining the following criteria:

1. 3/8" to 1/2" mortar joint.
2. ± 1/8" for overall wall height.
3. Corner square within 1/16".
4. Corner plumb and level within 1/8".
5. Mortar mixed per manufacturer's specifications.
6. All work completed within the time allotted by the instructor.
7. All tools and equipment cleaned.

The portion of the corner to be laid will be designated by the instructor. However, the designated portion may not be less than 4' in height or less than 80" in each direction or extended to the nearest opening. All tools, equipment and material will be supplied at your request.

STUDENT COMPETENCY SHEET

Unit: 04 Masonry

Competency Statement: 07 Lays up an 8" block intersecting stretcher

Performance Objective: 01 Having access to necessary tools and materials, you must lay up an 8" intersecting block wall and maintain the following:

1. 3/8" mortar joints.
2. + 1/8" for overall wall height.
3. All blocks in main wall laid to a line.
4. All blocks in short intersecting wall.
5. Mortar mixed per manufacturer's specifications.
6. All work completed within the time allotted by the instructor.
7. All tools cleaned after use.

Learning Activities:

1. Read pages 165-166 in Masonry Simplified, Volume 1.

2. Lay out in dry run two 8" intersecting walls. Have your instructor check your layout.

3. Bond all blocks as they are positioned in your layout. Maintain the seven criteria listed in the Performance Objective.

Criterion Evaluation:

Given access to necessary tools and materials, you will construct two 8" intersecting block walls maintaining the following:

1. 3/8" mortar joints.
2. ± 1/8" for overall wall height.
3. All blocks in main wall laid to a line.
4. All blocks in short intersecting wall squared, leveled and plumbed within 1/16".
5. Mortar mixed per manufacturer's specifications.
6. All work completed within the time allotted by the instructor.
7. All tools cleaned after use.

STUDENT COMPETENCY SHEET

Unit:	04	Masonry
Competency Statement:	08	Lays up a single flue brick chimney
Performance Objective:	01	Given a single flue patented brick chimney plan with all specifications, you will install the chimney and flue or that portion of it designated by the instructor. All required materials, tools and equipment will be supplied at your request. All installed materials must be plumb, level and aligned to within ± 1/8" and in accordance with the manufacturer's directions. All joints must be tight (no openings), struck, and cut. You must complete all work within the time allotted. You must install bricks at least to the top of the second flue tile to receive credit for this objective.

Learning Activities:

1. Read Modern Carpentry, pages 407-420. Answer questions 1-9 on page 419. The instructor will check your written responses.

2. Attend a lecture/demonstration on flue tile setting. Record the procedures for setting such tile in your notebook. The instructor will check your notes. Using your notes, set the flue tile designated by the instructor. The instructor will periodically check your work and evaluate your finished product.

3. Given a drawing and specifications, set up four joints of flue tile (8" x 12" x 24"). Evaluate your work using the information you obtained from Learning Activities 1 and 2. After you have evaluated your work, the instructor will check it.

Criterion Evaluation:

Given a single flue patented brick chimney plan with all specifications, you will install the chimney and flue or that portion of it designated by the instructor. All required materials, tools and equipment will be supplied at your request. All installed materials must be plumb, level and aligned to within ± 1/8" and in accordance with the manufacturer's directions. All joints must be tight (no openings), struck, an cut. You must complete all work wihtin the time allotted. You must install bricks at least to top of the second flue to receive credit for this objective.

STUDENT COMPETENCY SHEET

Unit:	04	Masonry
Competency Statement:	09	Lays up brick veneer wall at door and window locations
Performance Objective:	01	Given access to the necessary plans, tools, materials and equipment, you will lay up a brick veneer wall which contains a door and window opening and will place the lintel and sill in their proper posisions while maintaining the the following specifications: 1. 3/8" to 1/2" mortar joint. 2. + 1/8" for overall wall height. 3. All brick laid to a line. 4. All brick plumb and level within 1/8". 5. All work completed within the allotted time. 6. Lintel and sill placed in accordance with building plans. 7. All tools and equipment cleaned.

Learning Activities:

1. Read pages 93-98 in Masonry Simplified, Volume 1.

2. Obtain a brick hammer and some bricks. Practice breaking these bricks. Break several bricks to the following lengths: 4", 5 1/2", 6".

3. Obtain a piece of brick mold and attach it in a vertical, plumb position. Practice laying brick against this molding. The instructor will check your work.

4. Obtain a piece of 3 1/2" x 3 1/2" x 4' steel angle iron. Lay up a 2-foot-high brick wall with a three-foot opening. Place the steel angle over the opening and lay three courses of brick over the opening.

5. Lay up the brick wall you detailed in Learning Activity 1. Adhere to the specifications stated in the Performance Objective.

Criterion Evaluation:

Given access to the necessary plans, tools, materials and equipment, you will lay up a brick veneer wall which contains a door and window opening and will place the lintel and sill in their proper positions while maintaining the following specifications:

1. 3/8" to 1/2" mortar joint.
2. ± 1/8" for overall wall height.
3. All brick laid to a line.
4. All brick plumb and level within 1/8".
5. All work completed within the allotted time.
6. Lintel and sill placed in accordance with building plans.
7. All tools and equipment cleaned.

STUDENT COMPETENCY SHEET

Unit: 04 Masonry

Competency Statement: 10 Identifies basic materials for mixing concrete and their proper proportions

Performance Objective: 01 Given two designated concrete jobs, you will list the basic materials (concrete ingredients) and the amount of these materials needed to pour the job. You will have time to complete this activitiy. A copy of Table 7-2, page 197, Masonry Simplified, Volume 1 or a copy of a similar table may be used. You must list all required ingredients in their proper amounts.

Learning Activities:

1. Read Masonry Simplified, Volume 1, Chapter 7. Write a sentence or statement about each of the words listed below as they relate to concrete. Your instructor will check your work.
   a. fine aggregate
   b. coarse aggregate
   c. sand
   d. cement
   e. water

2. Read pages 196-199 in Masonry Simplified, Volume 1. Explain in writing the proper procedure for determining suitable proportions for mixing concrete. Your instructor will check your work.

3. Answer the questions on page 203 in Masonry Simplified, Volume 1.

4. Consult table 7-2 on page 197 of Masonry Simplified, Volume 1.

Criterion Evaluation:

Given two designated concrete jobs, you will list the basic materials (concrete ingredients) and the amount of these materials needed to pour the job. A copy of table 7-2, page 197, Masonry Simplified, Volume 1, or a copy of a similar table is the only reference you may use. You must list all required ingredients in their proper amounts.

STUDENT COMPETENCY SHEET

Unit:	04	Masonry
Competency Statement:	11	Works concrete surface using a float
Performance Objective:	01	Given access to necessary tools and materials, you will finish an 80-square-foot concrete surface using a wood float and broom, maintaining the following criteria: 1. Concrete mixed per manufacturer's specifications. 2. Concrete properly poured and finished, showing no exposed aggregate. 3. All tools and equipment cleaned.

Learning Activities:

1. Read pages 22-30 in The Practical Handbook of Concrete and Masonry. List three surfaces that should be given a rough finish and explain your answer. Your instructor will check your work.

2. Read pages 8-17 in The Practical Handbook of Concrete and Masonry and pages 192-199 in Masonry Simplified, Volume 1. Describe how concrete should be mixed. Your instructor will check your work.

3. From the reading assignment in Learning Activity 1, list the steps, in order, for working a concrete surface with a float. Your instructor will check your work.

4. Mix a small batch of concrete in a 2' x 2' x 2" form and practice using the wood float, scoring trowel, edging tool, and corner tool. Your instructor will check your work.

5. With the aid of a fellow student, mix enough concrete to fill an 8' x 10' x 3"form. Pour the concrete into the form, and, following the steps in Learning Activity 3, finish the concrete surface. Your instructor will check your work.

Criterion Evaluation:

Given access to necessary tools and materials, you will pour a concrete surface.
1. Concrete mixed per manufacturer's specifications.
2. Concrete properly poured and finished, showing no exposed aggregate.
3. All work completed within the time allotted by the instructor
4. All tools and equipment cleaned.

STUDENT COMPETENCY SHEET

Unit: 04 Masonry

Competency Statement: 12 Finishes concrete surface using a steel trowel

Performance Objective: 01 Given an area of wet concrete, you will finish the surface using a steel trowel. The area will be designated by the instructor. All necessary tools and materials will be supplied at your request. You must complete the assigned task according to the following criteria:

1. The finished surface must be smooth to the degree that trowel marks do not exceed 1/16" in depth or height.
2. The finished surface must be free of cracks, and pinholes must not exceed 1/16" in diameter.
3. The finished surface must be smooth to the degree that when a straightedge is laid across the surface the surface is free of depressions or ridges that exceed 1/8".
4. All tools must be cleaned.

Learning Activities:

1. Read pages 230-240 in Masonry Simplified, Volume 1. Explain in writing why a steel trowel is used in finishing concrete and list three surfaces that require a steel trowel finish. Your instructor will check your responses.

2. From the reading assignment in Learning Activity 1, list the directions for finishing a concrete surface using a steel trowel. Your instructor will check your list.

3. Obtain the necessary materials and construct a form between 4 and 6 square feet. Fill the form with sand and add enough water to make the sand firm enough to smooth with a steel trowel. Practice smoothing the sand with a steel trowel.

4. Place concrete in a 2' x 2' x 2" form, and, using a steel trowel, finish the concrete surface by following the directions you listed in Learning Activity 2. Your instructor will observe and evaluate your work. Repeat this activity as designated by the instructor.

Criterion Evaluation:

Given an area of wet concrete, you will finish the surface using a steel trowel. The area will be designated by the instructor and will be between 4 and 12 square feet. All necessary tools and materials will be supplied at your request. You must complete the assigned task according to the following criteria:

1. The finished surface must be smooth to the degree that trowel marks do not exceed 1/16" in diameter.
2. The finished surface must be free of cracks, and pinholes must not exceed 1/16" in diameter.
3. The finished surface must be smooth to the degree that when a straight-edge is laid across the surface the surface is free of depressions or ridges that exceed 1/8".
4. All tools must be cleaned.

STUDENT COMPETENCY SHEET

Unit:	05	Plumbing
Competency Statement:	01	Defines common plumbing terms
Performance Objective:	01	Given nine terms used in residential plumbing, you will define each term. All definitions must be in agreement with a prepared answer key. You will have time to complete your responses.

Learning Activities:

1. Read General Construction Trades, Oklahoma, pages 1-F through 30-F. List the terms from page 5-F in your notebook, and in your own words, define each term.

2. Working with another student, take turns identifying the terms you listed in Learning Activity 1.

3. Obtain a list of plumbing terms from the instructor. Define each term. Obtain an answer key and evaluate your responses.

Criterion Evaluation:

The instructor will give you a sheet of paper listing nine plumbing terms. You must define all terms with accuracy, and all responses must be in agreement with a prepared answer key. You will have time to complete your responses.

STUDENT COMPETENCY SHEET

Unit:	05	Plumbing
Competency Statement:	02	Identifies plumbing fittings and valves
Performance Objective:	01	Shown a display of 16 plumbing fittings and three types of valves, you will identify each by correct name. All replies must be in agreement with a prepared answer list. Answers must be completed within allotted time.

Learning Activities:

1. Attend a lecture/demonstration on the various types of pipe fittings and valves. List in your notebook each fitting and valve mentioned or displayed.

2. Using the list of fittings and valves from Learning Activity 1, identify each fitting and valve. Have the instructor check your work.

3. Using General Construction Trades, Oklahoma, pages 5-F and 6-F, and transparencies TM-1 and TM-3, take turns with another student identifying all the fittings and valves.

Criterion Evlauation:

The instructor will display 16 plumbing fittings and three valves and will require you to write the proper name of each. All answers must be completed within allotted time and must agree with a prepared answer key.

STUDENT COMPETENCY SHEET

Unit:	05	Plumbing
Competency Statement:	03	Identifies and states usage of pipe used for plumbing
Performance Objective:	01	Given a drawing or display of pipes (at least six different types) used for plumbing, you will identify in writing the name or type of each and state the usage of each pipe. All responses must be in agreement with available references. You will have time to complete this exercise with accuracy.

Learning Activities:

1. From any available reference material, list the various kinds of pipes used for plumbing and state their usage. Your instructor will check your list.

2. From a catalog of plumbing supplies and materials, find illustrations of each type of pipe you listed in Learning Activity 1. Either cut out a picture of each and paste them on a sheet of paper or list the page number where each type of pipe is located.

3. From a drawing or display of pipes used for plumbing, practice with another student identifying and stating the usage of each pipe.

Criterion Evaluation:

The instructor will display various types of piping used in residential plumbing (at least six different types). Each pipe will be numbered. List each number on a sheet of paper, and beside the number write the name of the pipe and state its usage. All responses must agree with available references. You will have time to complete your responses. You must achieve accuracy.

STUDENT COMPETENCY SHEET

Unit:	05	Plumbing
Competency Statement:	04	Identifies plumbing tools and states their uses
Performance Objective:	01	Shown a display of tools common to residential plumbing, you will identify each and state at least one usage for each. All identifications must be in agreement with a previously prepared answer key and all statements on usage must agree with available references.

Learning Activities:

1. Read General Construction Trades, pages 6-F, 10-F, to 12-F and 14-F. Make a list of all plumbing tools found in your shop area. Have the instructor check your work.

2. Attend a lecture/demonstration on plumbing tools and their use. Make a list of each tool mentioned in the demonstration and state how it is used. Be prepared to identify and state the usage of a tool when so directed by the instructor. The instructor will check your notes for completeness and accuracy.

3. Read General Construction Trades, pages 6-F, 10-F, 11-F, 12-F and 14-F. Complete the matching test on page 2 of this Competency Sheet.

4. Obtain each available tool in your shop and explain the use of the tool to another student. Have him evaluate your answers and report on your progress to the instructor.

Criterion Evaluation:

The instructor will display plumbing tools on a numbered display board. You will identify orally all tools shown. Then, in writing, give at least one usage of each tool shown. All identifications must be in agreement with a prepared answer key and all statements of usage must agree with references stated in the learning activities.

Test for Learning Activity 2.

Complete the matching test.

Tool	
1. pipe cutter	a. to thread pipe
2. pipe reamer	b. to solder copper fittings
3. pipe wrench	c. adjustable open end wrench
4. pipe vise	d. to clean threads of female screw fitting
5. ratchet threader	e. underledge and sink work
6. pipe die	f. to make heavy pipe bends
7. pipe tap	g. to clean inside of threaded pipe
8. tubing cutter	h. cut pipe to be threaded
9. tubing bender	i. to secure pipe while fabricating
10. flaging tool	j. to cup copper tubing
11. conduit bender	k. to tighten and loosen pipe and fittings
12. sweat torch kit	l. to make flare joints
13. cresent wrench	m. to fabricate pipe bends
14. basin wrench	n. to thread screwed pipe

Answer Key for Test for Learning Activity 3, Unit 5, Competency Statement 4.

1. h
2. g
3. k
4. i
5. a
6. n
7. d
8. j
9. m
10. l
11. f
12. b
13. c
14. e

STUDENT COMPETENCY SHEET

Unit: 05 Plumbing

Competency Statement: 05 Makes roughing-in cuts for installation of piping, vents and fixtures

Performance Objective: 01 Given a floor plan and all necessary specifications, you will demonstrate your ability to make roughing-in cuts for the installation of piping, vents and fixtures by completing the following tasks:

1. Marking all cuts in structural materials for the entire floor plan or for that portion designated by the instructor.
2. Making those cuts designated by the instructor. All necessary tools and materials will be supplied at your request.

You must complete the assigned tasks according to the following criteria:

1. All structural materials needing to be cut are marked so that no cut would exceed 1/4" of the size required to install the piping, vents or fixtures and no cut would be of insufficient size for installation.
2. Only those structural materials requiring cutting are marked.
3. All cuts are made to within $\pm$ 1/8" of the marked line.
4. All work completed within the time designated by the instructor.
5. Any sturctural material having a cut that would cause it to be unable to bear its load is reinforced.

Learning Activities:

1. Using available references, complete the following questions.
   a. What are roughing-in cuts?
   b. What precautions should be observed in making such cuts?
   c. How is the size of such cuts determined?

2. Obtain a floor plan, and, using available resources (references, manufacturer's installation directions, etc.), draw a sketch indicating the roughing-in cuts that would need to be made to install the vent piping, water supply, and the fixtures in the bathroom. Have the instructor evaluate your sketch.

3. Have the instructor arrange a visit to a residence that is being constructed and that has had the plumbing roughed-in. Examine the cuts that have been made and describe, in writing, or by sketching, the types of cuts that were made and how structural members were reinforced. Have the instructor check your work.

4. Have the instructor assign an area of an actual structure or a simulated one. Complete the following tasks:

   Obtain the floor plan and any manufacturer's directions, and
   a. Make a detailed sketch showing where and what types of cuts would be needed to rough-in the plumbing in the assigned area.
   b. Using your sketch, mark all structural materials that would need to be cut. Have the instructor inspect your marks.

Criterion Evaluation:

Given a floor plan and all necessary specifications, you will demonstrate your ability to make roughing-in cuts for the installation of piping, vents and fixtures by completing the following tasks:

1. Marking all cuts in structural materials for the entire floor plan or for that portion designated by the instructor.
2. Making those cuts designated by the instructor. All necessary tools and materials will be supplied at your request.

You must complete the assigned tasks according to the following criteria:

1. All structural materials needing to be cut are marked so that no cut would exceed 1/8" of the size required to install the piping, vents or fixture and no cut would be of insufficient size.
2. Only those structural materials requiring cutting are marked.
3. All cuts are made to within $\pm$ 1/8" of the marked line.
4. All work completed within the time designated by the instructor.
5. Any structural material having a cut that would cause it to be unable to bear its load is reinforced.

STUDENT COMPETENCY SHEET

Unit:	05	Plumbing
Competency Statement:	06	Fabricates pipe for plumbing, gas, water, sewers, and vents
Performance Objective:	01	Given a drawing and having access to all necessary tools, equipment and material, you will fabricate the piping designated by the instructor. The drawing will require the cutting and joining of the following types of piping: copper, galvanized, block steel, cast iron, PVC, and ABS. All work must be completed according to the following criteria: 1. All shop safety regulations observed. 2. All piping fabricated in accordance with specifications listed on the drawing. 3. All work completed within the allotted time. 4. No leaks occur.

Learning Activities:

1. Attend a lecture/demonstration on detailing pipe fabrication and the use of symbols for fabrication. Record in your notebook all procedures, terms and definitions used in the presentation. Be prepared to explain any term at the instructor's request.

2. Given a plumbing sketch, you will detail for fabrication all pipe and fittings shown. The instructor will check all measurements and fittings required in the plans. A-1 measurements must be within 1/16".

3. Attend a lecture/demonstration on the fabrication of copper pipe fittings. Record, in sequence, the fabrication methods demonstrated by the instructor. The instructor will check your notes. After the instructor has approved your list, fabricate the pipes designated by the instructor following each step from your procedural list. The instructor will periodically check your work and will inspect your final product.

4. Attend a lecture/demonstration on the fabrication of threaded, galvanized, and block steel pipe. List the procedures for joining these types of pipes. The instructor will check your notes. After the instructor has approved your list, fabricate the pipe designated by the instructor following each step listed in your procedural list. The instructor will periodically check your work and will inspect your final product.

5. Attend a lecture/demonstration on the fabrication of cast iron piping. Record the procedures to be followed in using lead to join cast iron pipes. The instructor will check your notes. After the instructor has approved your list, fabricate the pipes designated by the instructor following each step listed in your procedural list. The instructor will periodically check your work and will inspect your final product.

6. Attend a lecture/demonstration on the fabrication of PVC and ABS piping. Record the procedures to be followed when joining plastic piping. The instructor will check your notes. After the instructor has approved the list, fabricate the pipes designated by the instructor following each step in your procedural list. The instructor will periodically check your work and will inspect your final product.

Criterion Evaluation:

Being issued a plumbing schedule for a building plan and having access to the necessary materials, tools and equipment, you will fabricate the piping designated by the instructor. The drawing will requrie the cutting and joining of the following types of piping:

a. copper
b. galvanized steel
c. block steel
d. cast iron
e. PVC
f. ABS

All work must be completed according to the following criteria:

1. All shop safety regulations observed.
2. All piping fabricated in accordance with specifications listed on the drawing and schedule.
3. No leaks occur.

STUDENT COMPETENCY SHEET

Unit: 05 Plumbing

Competency Statement: 07 Installs drains, waste, and vents (DWV) using plastic pipe

Performance Objective: 01 Given a house plan with a plumbing schedule and specifications and access to any necessary tools and materials, you will install the drain, waste, and vent pipes as designated by your instructor, maintaining the following criteria:

1. All pipes fabricated and installed within ± 1/8" of specifications.
2. All joints sealed having no leaks.
3. All work completed within an allotted time limit.
4. No materials wasted due to improper measurement, cuts, or misuse of tools.

Learning Activities:

1. Read pages 9-15 in Plumbing. Define the following terms and answer the following questions.
   a. drain pipe
   b. fixture drain
   c. waste pipe
   d. soil pipe or soil stack
   e. building or house drain
   f. building or house sewer
   g. main
   h. stack
   i. clean outs
   j. waste stack
   k. vent stack
   l. trap
   m. branch vent
   n. dual vent
   o. continuous waste and vent
   p. relief vent
   q. back vent
   r. wet vent
   s. horizontal branch or lateral
   t. What are the two chief classes of piping and fittings in a drainage system?
   u. What is the importance of venting?

2. Read Chapter 5, page 46 in Plumbing. Answer the following questions:
   a. Give the minimum diameters in inches for these fixture drains:
      1. bathtub
      2. lavatory
      3. water closet
      4. kitchen sink
   b. Discuss the slope of drain lines.
   c. When may common waste pipes be used?

3. Using available resources, draw a drainage system for a bathroom. You do not have to show vents. Your instructor will check your drawing.

4. Study Chapter 6, page 57 in Plumbing. After studying this chapter, add the necessary vents to the drawing completed in Learning Activity 3. Your instructor will check your drawing.

5. Have the instructor designate which of the following tasks you are to complete. Obtain the necessary plans, materials, and tools for each designated task. When you have completed a task have the instructor evaluate your work before proceeding to the next task. Use plastic piping and do not make permanent connections unless so directed by the instructor.
   1. Install the drain for a sink or basin.
   2. Install the drain for a toilet.
   3. Install the venting for a bathroom.
   4. Install a main waste drain to a sewer top.

6. Obtain a DWV drawing from your instructor. Given access to necessary tools and materials, cut and assemble the drain, waste, and vent pipes as shown on the drawing. It is not necessary that you make permanent connections at this time. You may have another student aid you with lifting, holding, etc.

Criterion Evaluation:

Given a house plan with a plumbing schedule and specifications and access to necessary tools and materials, you will install the drain, waste, and vent pipes as designated by your instructor, maintaining the following criteria:
1. All pipes fabricated and installed within $\pm$ 1/8" of specifications.
2. All joints sealed having no leaks.
3. All work completed within an allotted time limit.
4. No materials wasted due to improper measurements, cuts or misuse of tools.

STUDENT COMPETENCY SHEET

Unit:	05	Plumbing
Competency Statement:	08	Conducts a percolation test
Performance Objective:	01	You will determine the suitability of a given plot of ground for installation of a septic tank system by conducting a soil percolation test on the plot of ground. All determinations must be done in accordance with Design Standards for Small Septic Tank Systems and within a time limit allotted by the instructor. You may use references and necessary tools and materials.

Learning Activities:

1. Read ES-52, Design Standards for Small Septic Tank Systems, pages 5-6. List the three steps followed when conducting a percolation test.

2. Following the three steps listed in Learning Activity 1, conduct a percolation test on a plot of ground designated by your instructor. Record all necessary data on a separate sheet of paper. Compare your data with the results obtained by a fellow student.

Criterion Evaluation:

The instructor will designate a plot of ground. You will determine the suitability of this plot of ground for installation of a septic tank system by conducting a soil percolation test on the plot of ground. All determinations must be done in accordance with Design Standards for Small Septic Tank Systems and within a time limit allotted by the instructor. You may use references and any necessary tools and materials.

STUDENT COMPETENCY SHEET

Unit:	05	Plumbing
Competency Statement:	09	Demonstrates knowledge of design standards for small septic tank systems
Performance Objective:	01	You will demonstrate your knowledge of septic tank system design and construction by correctly answering questions on a written test. A response must agree with Design Standards for Small Septic Tank Systems, to be considered correct.

Learning Activities:

1. Read Design Standards for Small Septic Tank Systems, pages 1-5. Then answer the following questions:
   a. What is a septic tank system?
   b. What construction materials are permitted for septic tanks?
   c. List eight general considerations that should be given attention before starting to design a septic tank system.
   d. How often should a septic tank system be serviced?

2. Obtain from your instructor an application for a permit to install a septic tank. Complete all applicable sections of this permit. Your instructor will check your work.

3. Read pages 8-15 in Design Standards for Small Septic Tank Systems. Draw a cross-section absorption trench detail.

4. Answer the following questions concerning design standards for septic tank systems:
   a. What is the minimum size septic tank permitted for two or fewer bedrooms? three bedrooms? four bedrooms?
   b. What is the maximum depth permitted for an absorption trench?
   c. What are the limits of width permitted for an absorption trench?
   d. How many inches of gravel are required over and under a drain tile?
   e. How far apart must absorption trenches be?
   f. What size drain pipe is permitted?
   g. What slope should drain tiles be laid to?
   h. What is the maximum length allowed for an absorption trench?
   i. What is the maximum size lot required if both a water and sewer system are to be developed?
      Sewer system only?

j. What is the maximum length of absorption trench per bedroom?
k. How close to a well can a septic tank be located?
l. How close to a well can a soil absorption field be located?
m. If the septic tank is 75 feet from a well, what must be done before starting a soil absorption field?

Criterion Evaluation:

You will demonstrate your knowledge of septic tank design and construction by correctly answering the questions listed below. For a response to be correct it must be in agreement with Design Standards for Small Septic Tank Systems. Have pre and post-test and arrange a field trip for observation of a septic system installation prior to the post-test.

1. What is a septic tank system?
2. How often should a septic tank system be serviced?
3. What is the minimum size septic tank permitted for two or fewer bedrooms? three bedrooms? four bedrooms?
4. What is the maximum depth permitted for an absorption trench?
5. What are the limits of width permitted for an absorption trench?
6. How many inches of gravel are required over and under a drain tile?
7. How far apart must absorption trenches be?
8. What size drain pipe is permitted?
9. What slope should drain tiles be laid to?
10. What is the maximum length allowed for an absorption trench?
11. What is the minimum length of absorption trench per bedroom?
12. What is the minimum size lot required if both a water and sewer system are to be developed?
    Sewer system only?
13. How close to a well can a septic tank be located?
14. How close to a well can a soil absorption field be located?

STUDENT COMPETENCY SHEET

Unit:	05	Plumbing
Competency Statement:	10	Installs main hot and cold water supply in residence (includes hot water tank)
Performance Objective:	01	Given a drawing showing specifications of a main hot and cold water supply to a residence and all necessary tools and materials, you will install this water supply, including the hot water tank, maintaining the following criteria: 1. All pipes cut within + 1/16" as shown on the drawing. 2. All copper fittings and valves positioned as shown on the drawing. 3. All joints and fittings joined with no leaks. 4. All work completed within the time allotted by the instructor.

Learning Activities:

1. Attend a demonstration on plumbing a hot water tank. List in writing all steps in the order they are demonstrated. Have the instructor check your notes.

2. Using any available references and the manufacturer's installation directions, list the tools and procedures that would be required to install a hot water tank.

3. Obtain a drawing from your instructor which shows the specifications of a water supply to a residence. Study the drawing and make a list of the materials, tools, and procedures you would use to install the water supply. Have the instructor evaluate your list. With the instructor's approval, install the water supply, including the hot water tank. Inspect your work to determine if it meets the criteria listed in the Performance Objective. After you have completed your inspection, notify the instructor and he will evaluate your work.

Criterion Evaluation:

Given a drawing showing specifications of a main hot and cold water supply to a residence and all necessary tools and materials, you will install the water supply, including the hot water tank, maintaining the following criteria:

1. All pipe cut within $\pm$ 1/16" as shown on the drawings.
2. All fittings and valves positioned as shown on the drawing.
3. All joints and fittings joined with no leaks.
d. All work completed within time limit given by the instructor.

STUDENT COMPETENCY SHEET

Unit: 05 Plumbing

Competency Statement: 11 Installs fixtures (water closet, bathtub, lavatory, kitchen sink) and connects water supply and waste lines

Performance Objective: 01 Given access to necessary tools and materials, you will install two or more of the following components as designated by the instructor: water closet, bathtub, lavatory or kitchen sink. You will connect the water supply and waste lines to each designated component. All work must meet the following criteria:

1. All fixtures installed in accordance with manufacturer's directions and building plans and specifications.
2. No leaks in any connections.
3. All work completed within the time allotted by the instructor.
4. No fixtures, connections or building parts damaged due to neglect or misuse of tools.

Learning Activities:

1. Using any available references, define the following terms:
   a. floor flange
   b. wax gasket
   c. supply line
   d. shut off valve
   e. trap
   f. tub and shower filler
   g. waste and overflow (trip lever)
   h. shower head
   i. continuous waste

2. Read pages 27-31 in Plumbing. Obtain a floor flange and a wax gasket. Draw a picture similar to Figure 15 on page 29 showing details of a closet bowl connection. Your instructor will check your drawing.

3. Obtain a floor flange, and using it for a pattern, mark and cut a hole in a subfloor for the flange to sit in. Select proper size wood screws and anchor the flange to the floor. Your instructor will check your work.

4. Attend a demonstration on connecting a closet bowl to the floor. List the steps in the order they are demonstrated. The instructor will check your list.

5. Using available references, connect a closet bowl to the floor. Your instructor will check your work.

6. Obtain a set of drawings and directions from your instructor for attaching a tank to a closet bowl. Read these carefully and ask your instructor questions on any item you do not understand. List, in writing, the steps required to attach this tank.

7. Attend a demonstration on attaching a tank to a closet bowl and connecting the water supply. Repeat this demonstration to your instructor.

8. Obtain a tub and shower filler from your instructor. There should be a drawing and some directions with it. Assemble this tub and shower filler as it would look if it were attached to the tub.

9. Attend a demonstration on attaching a tub and shower filler to a tub. Repeat this demonstration to your instructor.

10. Obtain a waste and overflow for a bathtub from your instructor. Assemble this waste and overflow as it would look if it were attached to the tub.

11. Attend a demonstration on attaching a waste and overflow to a bathtub. Repeat this demonstration to your instructor.

12. Obtain a lavatory faucet set with pop up drain from your instructor. There should be a set of directions with it. Read these directions carefully. Ask questions on any item not clear to you.

13. Attend a demonstration on installing a lavatory faucet set with a pop up drain. Repeat this demonstration to your instructor.

14. Obtain a sink faucet set with spray. There should be a drawing and a set of instructions with it. Read these carefully and ask questions on any item you feel you do not understand.

15. Assemble and install the sink faucet set with spray as shown in the drawing. Your instructor will check your work.

16. Obtain a continuous waste unit for a double bowl kitchen sink. Assemble this continuous waste as it would look it it were attached to the sink.

17. Attend a demonstration on installing a continuous waste to a double bowl kitchen sink. Repeat this demonstration to your instructor.

Criterion Evaluation:

Given access to necessary tools and materials, you will install two or more of the following components as designated by the instructor: water closet, bathtub, lavatory or kitchen sink. You will connect the water supply and waste lines to each designated component. All work must meet the following criteria:

1. All fixtures installed in accordance with manufacturer's directions and building plans and specifications.
2. No leaks in any connections.
3. All work completed within the time allotted by the instructor.
4. No fixtures, connections or building parts damaged due to neglect or misuse of tools.

STUDENT COMPETENCY SHEET

Unit: 05 Plumbing

Competency Statement: 12 Mounts furnace, venting, and thermostat

Performance Objective: 01 The instructor will designate a forced warm air furnace, and you will mount the furnace and connect the venting and the thermostat. All necessary tools, equipment and materials will be supplied at your request. Another student may assist you in lifting or handling. All work must be performed according to the following criteria:

1. All shop safety regulations observed.
2. All shop electrical safety practices observed.
3. All work completed within the time allotted by the instructor.
4. All work completed in accordance with manufacturer's directions.
5. No tools, equipment, or parts damaged through student's neglect or misuse of tools.
6. No air leaks at flue or vent connections.

Learning Activities:

1. Read pages 202-205 in General Architectural Drawing. Answer on a separate sheet of paper questions 1, 3, 5-7, and 9-11 on page 218.

2. Using available reference material, write a definition for each of the following terms. Your instructor will check your work.
   a. subbase
   b. clearance to combustible materials
   c. dual wall vent pipe
   d. factory wiring
   e. field wiring
   f. thermostat
   g. horizontal furnace
   h. downflow
   i. upflow
   j. thermostat wire

3. Obtain a general set of instruction from your instructor for installing a forced warm air furnace. Read them carefully and list five items which warrant special attention when installing the furnace.

4. Using available references, list the two most common methods of supporting a horizontal furnace in a crawl space and the most common way of mounting a downflow on a combustible floor.

5. Obtain the manufacturer's directions for a furnace designated by the instructor and read them carefully. Consult the instructor on any procedure not clear to you. Mount the furnace. You may use another student to aid with lifting, holding, etc. Have the instructor inspect your work.

6. Read the manufacturer's directions for mounting a thermostat. List four items of special attention that should be observed when installing a thermostat. After the instructor evaluates your list, install the thermostat. Observe all shop safety regulations. Do not energize the thermostat until the instructor inspects your work.

7. From available references, list three items of special attention which should be observed when venting a furnace. Following the manufacturer's directions, install or connect the venting. Have the instructor inspect your work.

8. Check the operation of the furnace for proper flame action and thermostatic control. Report the results to the instructor.

9. Repeat Learning Activities 5-8 on another furnace model.

Criterion Evaluation:

The instructor will designate a forced warm air furnace, and you will mount the furnace and connect the venting and the thermostat. All necessary tools, equipment, and materials will be supplied at your request. Another student may assist you in lifting or handling. All work must be performed according to the following criteria:

1. All shop safety regulations observed.
2. All shop electrical practices observed.
3. All work completed within the time allotted by the instructor.
4. All work completed in accordance with manufacturer's directions.
5. No tools, equipment, or parts damaged through student's neglect or misuse of tools.

STUDENT COMPETENCY SHEET

Unit: 05 Plumbing

Competency Statement: 13 Installs duct system for heating

Performance Objective: 01 Given a heating layout, you will install that portion of the duct work designated by the instructor. To receive credit for this objective you must install at least two trunk line sections and three warm air runs. All tools, equipment, and materials will be supplied at your request. Your work must meet the following criteria:

1. All shop safety regulations observed.
2. All work completed within the time designated by the instructor.
3. All work done in accordance with the manufacturer's specifications and heating layout.
4. No air leaks occur in the system.

Learning Activities:

1. Using available reference materials, define, in writing, the following terms. Your instructor will check your definitions.
   a. plenum
   b. takeoff
   c. end cap
   d. return air
   e. angle boot
   f. end boot
   g. register
   h. grill
   i. duct tape
   j. damper
   k. perimeter system
   l. duct
   m. extended plenum
   n. spider web
   o. clip
   p. tab
   q. panning
   r. filter
   s. trunk line
   t. drives

2. From a heating blueprint which will be furnished by your instructor, detail one of the warm air runs from the trunk line to the register.

3. From a catalog of heating materials, find and cut out as many of the items listed in Learning Activity 1 as you can. Label each item. Your instructor will check your work.

4. Attend a demonstration on cutting sheet metal with tin snips. Obtain a piece of sheet metal and tin snips and practice making rectangular and circular cuts in the sheet metal. Your instructor will evaluate your cuts.

5. Attend a demonstration on installing the trunk line and making the warm air run from the trunk to the room. List the steps needed to get from the furnace to the heated room. Your instructor will check your list.

6. Following the steps in Learning Activity 5, install a warm air run from the trunk line takeoff to the heated room. Your instructor will observe your work. Repeat this activity as directed by the instructor.

Criterion Evaluation:

Given a heating layout, you will install that portion of the duct work designated by the instructor. To receive credit for this objective you must install at least two trunk line sections and three warm air runs. All tools, equipment, and materials will be supplied at your request. Your work must meet the following criteria:

1. All shop safety regulations observed.
2. All work completed within the time designated by the instructor.
3. All work done in accordance with the manufacturer's specifications and heating layout.
4. No air leaks occur in the system.

STUDENT COMPETENCY SHEET

Unit: 05 Plumbing

Competency Statement: 14 Insulated furnace duct work

Performance Objective: 01 The instructor will designate a portion of the duct work. You will insualte this duct work maintaining the criteria below. All materials, equipment, and tools will be made available at your request.

1. All work done to manufacturer's specifications.
2. All work done within the time designated by the instructor.
3. All work completed without any damage to the duct and without wasting materials.

Learning Activities:

1. From available reference material, write a procedure you feel someone else could read and understand on how to insulate a section of duct work designated by the instructor. Adhere to the criteria set forth in the Performance Objective.

2. Using the procedure from the above activity, insulate a section of duct work designated by the instructor. Adhere to the criteria set forth in the Performance Objective.

Criterion Evaluation:

The instructor will designate a portion of duct work. You will insulate this duct work maintaining the criteria below. All materials, equipment, and tools will be made available at your request.

1. All work done to manufacturer's specifications.
2. All work done within the time designated by the instructor.
3. All work completed without any damage to the duct and without wasting materials.

STUDENT COMPETENCY SHEET

Unit:	05	Plumbing
Competency Statement	15	Supplies water to residence from different sources
Performance Objective:	01	Given a set of plans and manufacturers suggestions and Health Department specifications, you will determine materials and equipment needed to install a water supply system, from all the different supply sources. 1. City supply 2. Wells 3. Springs 4. Cistern

Learning Activities:

1. Use any references available from the County Health Department in your county, and from Superintendent of Documents, Washington, D.C.

2. Conduct a field trip to observe the installation of the different types of water systems.

3. Obtain from business and industry different types of pumps for demonstration purposes.

4. Invite members of the State Health Department to give a lecture on water systems.

5. Make a list of different types of pumps used in water systems.

6. Obtain information from the Health Department on ways to purify water systems.

Criterion Evaluation:

Given a sample set of plans and specifications, you will determine the materials and equipment needed to install the following water supply systems:

1. City Supply
2. Wells
3. Springs
3. Cistern

Cluster: Building Construction

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